One Truckee River Framework
Vegetation Management and Restoration Plan

SEPTEMBER 2022

PREPARED FOR

One Truckee River and Nevada Land Trust

PREPARED BY

SWCA Environmental Consultants

ONE TRUCKEE RIVER FRAMEWORK VEGETATION MANAGEMENT AND RESTORATION PLAN

Prepared for

One Truckee River and Nevada Land Trust
2601 Plumas Street
Reno, Nevada 89509

Prepared by

SWCA Environmental Consultants
1575 Delucchi Lane, Suite 223
Reno, Nevada 89502
(775) 686-6379
www.swca.com

SWCA Project No. 58424

September 2022

CONTENTS

Appendices

Tables

Figures

1 PURPOSE AND NEED

One Truckee River (OTR) is currently advancing sustainable vegetation management along the Truckee River to improve healthy functioning of the river system. This effort is focused on the middle, urbanized reach of the Truckee River that includes the cities of Reno and Sparks and the Reno-Sparks Indian Colony tribal land in Washoe County, Nevada, in the metropolitan area known as the Truckee Meadows (Project Area, Figure 1). This planning effort addresses OTR's prioritized action item 1.4.c—to develop and implement a coordinated vegetation management plan along the river—from the *One Truckee River Management Plan* (OTR 2016).

The effort began in 2020 with the formation of the Vegetation Management Steering Committee, which comprises OTR and Nevada Land Trust staff members and OTR's chosen consultants. The committee worked together to identify the local agencies and organizations with a stake in the development of a coordinated vegetation management plan and invited them to join the Vegetation Management and Restoration Planning Technical Working Group (TWG). TWG members created the vision for the project, identified management opportunities and techniques, and provided regular input on the planning process and strategies for pilot restoration project implementation.

This framework vegetation management and restoration plan (Framework Plan or Plan) is the result of OTR's vegetation management master planning work and aims to address the needs and challenges of multiple entities that manage vegetation along the Truckee River in the Project Area. This Plan is intended to serve as a resource for public and private partners and to inform coordinated vegetation management planning and implementation efforts in the future. This Plan identifies a variety of restorative activities that fit within the "restorative continuum" defined by Gann et al. (2019). That continuum of restorative activities identified in the document can be tailored to meet the needs and constraints of the urbanized environment.

OTR has received funding for development of this Framework Plan from the U.S. Bureau of Reclamation's WaterSMART Grant Program. Nevada Land Trust is providing administrative and stakeholder coordination support. SWCA Environmental Consultants has been selected to help OTR lead the coordination and Plan development process with technical assistance from Resource Concepts, Inc.

1.1 Goals

This Framework Plan addresses **three primary goals**, which were developed with stakeholder guidance and input (as described in Section 1.2 of this document):

> **Goal 1:** Develop a coordinated vegetation management and restoration plan for the Project Area that identifies vegetation management techniques that fit within the regulatory constraints and directives and addresses critical issues and needs along the river.
>
> **Goal 2:** Create useable tools for implementation-level restoration and vegetation management planning for the Project Area. These tools are designed to support and generate momentum for projects to be envisioned, planned, and implemented and to facilitate future collaboration among OTR's partners and stakeholders.
>
> **Goal 3:** Develop a vision for coordinated vegetation management within the Project Area that supports consistent management across governing authorities.[1]

[1] Management techniques are not the same for every jurisdiction.

1.2 Technical Working Group Member and Stakeholder Input

Local agency and expert input have directly guided the development of this Plan. Authorities with direct jurisdiction over the river were interviewed during the Plan development process, whereas other feedback was gleaned during TWG meetings and informal discussions (Table 1). During the interviews, meetings, and discussions conducted to date, several themes have arisen, both in 1) desired outcomes from OTR's vegetation management planning effort, and 2) challenges and needs regarding vegetation management.

An organization's level of involvement in the process is defined by whether they chose to be a TWG member or a TWG stakeholder. Stakeholders were available for document review and input as needed, whereas members participated at a more involved level, including attending TWG meetings.

Table 1. Stakeholders and Members Interviewed and/or Participating in the Technical Working Group

Agency or Entity Name	Person(s) Interviewed and/or Participating in the TWG	TWG Level of Involvement
Carson-Truckee Water Conservancy District	Kayla Dowty Lori Williams	TWG member TWG member
City of Reno Clean and Safe Team	Cynthia Esparza	TWG stakeholder
City of Reno Fire Department	Tray Palmer	TWG stakeholder
City of Reno Parks and Recreation	Jaime Schroeder Matt Brezina	TWG member TWG stakeholder
City of Reno Parks and Recreation Horticulturalist	Ryan Sharrer	TWG member
City of Reno Police Department	Ernie Kazmar	TWG stakeholder
City of Reno Public Works	Daniel Moss	TWG member
City of Reno Urban Forestry	Matt Basile	TWG member
City of Sparks Public Works	Ron Korman Mark Anderson	TWG member TWG member
Downtown Reno Partnership	Nathan Digangi	TWG stakeholder
Friends of Nevada Wilderness	Shaaron Netherton	TWG stakeholder
Great Basin Institute	Scott Scherbinski Rachel Durben Aurora Pinkney-Drobnis	TWG member TWG member TWG member
Karma Box Project	Grant A. Denton	TWG stakeholder
Keep Truckee Meadows Beautiful	Mark Cameron Lindsey Panton	TWG stakeholder TWG stakeholder
Nevada Department of Agriculture	Jake Dick	TWG member
Nevada Department of Wildlife	Bobby Jones Tori Cernoch	TWG member TWG member
Nevada Division of Environmental Protection	John Paul Kiel	TWG member
Nevada Division of Forestry	Anna Higgins Bill Buckley	TWG member (former) TWG member
Nevada Division of State Lands	Lucy Wong Karen Gonzalez	TWG member (former) TWG member

Agency or Entity Name	Person(s) Interviewed and/or Participating in the TWG	TWG Level of Involvement
Nevada Division of Water Resources	Tom Pyeatte	TWG member
Nevada Land Trust	Alicia Reban John Houk	Vegetation Management Steering Committee member Vegetation Management Steering Committee member
OTR	Iris Jehle-Peppard	Steering Committee member
Recreational river user	Charles Albright	TWG stakeholder
Reno-Spark Indian Colony	Michon Eben	TWG stakeholder
Resource Concepts, Inc.	Lynn Zonge	Vegetation Management Steering Committee member
SWCA Environmental Consultants	Mandy Bengtson Susan Mortenson Sophie Butler	Vegetation Management Steering Committee member Vegetation Management Steering Committee member Vegetation Management Steering Committee member
The Nature Conservancy	Chris Sega	TWG member
Trout Unlimited	Dan Johnson	TWG stakeholder
Truckee Meadows Regional Planning Agency	Jeremy Smith	TWG stakeholder
Truckee Meadows Parks Foundation	Elena Larson	TWG member
Truckee Meadows Water Authority	Kara Steeland	TWG stakeholder
Truckee River Flood Management Authority	Danielle Henderson	TWG member
Urban Ecology Solutions, LLC	Carrie Jensen	TWG member
United States Fish and Wildlife Service	Justin Barrett	TWG stakeholder
Washoe County Regional Parks and Open Space	Joanne Lowden Sophia Kirschenman	TWG member TWG member

1.2.1 Desired Outcomes

Stakeholders expressed **two** primary desired outcomes of this Framework Plan and supporting efforts:

1. Develop partnerships across governing authorities and work together to push forward progress and leverage funding.
2. Develop a vegetation management guide, which could be used as a resource when developing implementation plans for projects, within constraints and within ecological considerations. The guide should include a plant list and considerations of species, methods of thinning vegetation, and weed control.

1.2.2 Challenges and Needs

Stakeholders identified several challenges and needs that fall into **four** categories: 1) vision for vegetation management, 2) compatible vegetation management strategies, 3) effective vegetation management strategies, and 4) partnership and resources. These categories are described in the following sections.

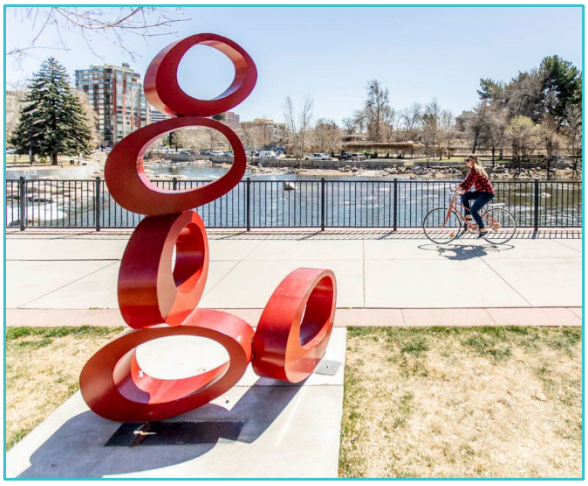
1.2.2.1 VISION FOR VEGETATION MANAGEMENT

Stakeholders identified the following needs related to developing a vision for vegetation management:

- Establish a coordinated and long-term vision for vegetation management along the Truckee River. Vegetation management has often been reactive and directed at addressing acute issues, such as dead or hazardous trees, fires, responding to water conveyance requests, and clearcutting to dissuade people from camping on the river. Having a coordinated vision will ensure vegetation management meets long-term and short-term needs.
- Develop a framework that identifies steps to developing an implementation-level restoration plan (including how to navigate permitting and approval processes) and streamlines preparation and execution of implementation-level plans.
- Address water quality, which is an issue of concern that relates to vegetation management. Sedimentation can result from construction and restoration efforts; however, vegetation establishment will improve water quality. Coordinated vegetation management strategies along the river are needed to specifically address water quality and balance short-term construction impacts with long-term water quality goals.
- Develop a vision for vegetation management along the river that meets the needs of all members of the community and supports all beneficial uses of the river (native riparian vegetation, wildlife, water quality, recreational use, etc.).
- Identify priority areas for future vegetation management and restoration implementation projects.

1.2.2.2 COMPATIBLE VEGETATION MANAGEMENT STRATEGIES

Stakeholders identified the following needs related to developing compatible vegetation management strategies:



- Identify species (preferably native species) and vegetation management approaches (preferably with natural materials) that are compatible with regulatory constraints and directives for all governing authorities (see Regulatory Framework in Appendix A). Identify compatible best management practices that agencies are likely to approve.
- Ensure water conveyance and meet requirements of the 14,000-cubic feet per second (cfs) conveyance zone[2] (the "Martis

[2] A conveyance zone "represents a preservation zone for passing flood flows along the creek corridor without increasing flood depths, redirecting floodwaters or adversely impacting land areas. The establishment of a conveyance zone recognizes that development activities are expected to occur in [a regulated floodway or established floodplain] but places a limit on these activities to prevent adverse impacts" (City of Boulder 2020:7).

Agreement;" U.S. Army Corps of Engineers [USACE] 1973) and the 6,000-cfs conveyance zone (USACE 1964, 1973). Guidance is needed on how to manage and maintain vegetation beyond clear-cutting.

- Identify which vegetation or other techniques will discourage foot traffic and camping, particularly in areas where human activity and disturbance should be avoided. For example, people remove or damage vegetation, start fires, and break irrigation equipment. Municipalities commonly clear-cut areas to discourage camping. Strategies are needed to manage human use and encourage appropriate recreational uses in some areas and support restoration in other areas.
- Consider wildfire management during vegetation management planning efforts to adequately assess and prepare for fire risk.
- Identify strategies to address water quality standards, especially water temperature.
- Control noxious weeds as defined by the Nevada Department of Agriculture with a coordinated strategy to minimize upstream to downstream weed establishment.
- Identify regional planning policies and local municipality codes/ordinances that, if revised, will better support vegetation management and restoration implementation.
- Address clear-cutting of trees for public safety (crime prevention, hazard trees, river safety); consider how dead trees are valuable habitat for wildlife and balance the needs for safety versus maintaining habitat structure.

1.2.2.3 EFFECTIVE VEGETATION MANAGEMENT STRATEGIES

Stakeholders identified the following needs related to developing effective vegetation management strategies:

- Develop vegetation management techniques that support healthy aquatic and riparian habitats for wildlife and improve water quality, particularly for special-status aquatic species.
- Develop strategies (species and vegetation management techniques) that stabilize soils and mitigate soil erosion.
- Address the challenges of reestablishing or maintaining native species. For example, low cottonwood recruitment along the river is the result of limited establishment surfaces.[3] Many cottonwoods (*Populus* sp.) are in slow decline because riverside path maintenance buries roots, leading to oxygen deprivation.
- Address the establishment of and impacts from noxious weeds and other nonnative species, including tree of heaven (*Ailanthus altissima*), Russian olive (*Elaeagnus angustifolia*), tall whitetop (*Lepidium latifolium*), and Siberian elm (*Ulmus pumila*).
- Address challenges presented from beavers damaging native trees (especially cottonwood trees), which then must be removed for public safety or to prevent dead trees from falling into the river, which restricts flow conveyance within the 14,000- and 6,000-cfs zones.
- Find vegetation species and strategies that are compatible with recreational use.
- Address wild horses, beavers, or other unexpected challenges that derail the success of revegetation and restoration efforts.
- Address irrigation needs to support revegetation success.

[3] Flow prescriptions designed for cottonwood recruitment along the Truckee River are in effect but only support recruitment in areas with connected floodplains that are not channelized. Much of the Project Area stretch of the river is channelized.

- Develop plans and budgeting strategies for maintenance in perpetuity (e.g., weeds, thinning, replanting) for restoration projects and established vegetation along the Truckee River.
- Clearly define the permitting and approval process to guide project planning and implementation.

1.2.2.4 PARTNERSHIP AND RESOURCES

Stakeholders identified the following needs related to partnerships and resources:

- Establish partnerships to effectively implement projects. The lack of hard funding and dedicated staff for vegetation management make planning and implementing projects challenging. Partnerships through resource and staff sharing can increase project efficiency, saving time and money.
- Coordinate by sharing ideas and lessons learned as restoration projects are implemented, so everyone can learn from the experiences of others.
- Recognize that working across governing authorities can be challenging when planning and executing projects, especially when governing authorities have differing needs or management approaches.
- Improve coordination and partnerships across agencies to treat big weed infestations that occur across jurisdictional boundaries.
- Generate momentum for next steps, such as identifying pilot projects, bringing together resources, identifying labor sources (paid or volunteers), and securing funding to plan and implement restoration projects.
- Explore master planning documents to plan restoration projects that align with master plans to ensure buy-in from government leaders.
- Compile all relevant spatial data in a web map to support future planning efforts.

2 BACKGROUND AND PROJECT CONTEXT

2.1 One Truckee River's Mission and Approach

OTR is a coalition of public and private partners working together to implement Phase I of the *One Truckee River Management Plan* (OTR 2016). OTR's mission is "to ensure a healthy, thriving, sustainable river connected to the hearts and minds of its community" (OTR 2016:15). OTR works as a watershed coalition to unite agencies and nonprofits with the support from residents, private entities, and other stakeholders to manage impacts affecting the Truckee River watershed. By uniting stakeholders, OTR aims to implement riparian restoration techniques to improve water quality, ecological resilience, native species habitat, and flood management within the Truckee River watershed. Although this vegetation management effort employs methods within the primarily urbanized segment of the river, future restoration projects will provide benefits throughout much of the watershed.

2.2 Truckee River Watershed

2.2.1 Watershed Description and Conditions

The Truckee River flows for 121 miles from Lake Tahoe, California, to Pyramid Lake, Nevada (a terminal lake), within U.S. Geological Survey hydrological unit code 16050102. The Truckee Meadows consists of the cities of Reno and Sparks, Washoe County, and Reno-Sparks Indian Colony tribal lands, which are in the middle reach of the Truckee River (see Figure 1). Environmental impacts within the Truckee Meadows include 1) how current development, recreation, and camping affect water quality, ecological resiliency, flooding, and native species around and downstream of the urban core, and 2) how upstream impacts from recreational use and development, historical grazing, logging, manufacturing, and mining affect water quality; currently, 85% of the region's drinking water comes from the Truckee River. These impacts to the Truckee River have caused several issues within the Truckee Meadows and downstream into the lower Truckee River. These issues include impaired water quality for temperature and turbidity; bank hardening and channelization, loss of native vegetation species and introduction of noxious and invasive species, threats to the federally endangered cui-ui (*Chasmistes cujus*) and federally threatened Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*) that inhabit the river, and more frequent and extreme flood events caused by climate change and increasing areas of impervious surfaces (Truckee Meadows Water Authority 2020). Despite a history of human impacts, the Truckee River remains a "water of high quality" as defined by the U.S. Environmental Protection Agency (EPA), and therefore continued efforts are needed to ensure water quality is protected and enhanced in the future. The *2020 Integrated Source Water and 319(h) Watershed Protection Plan for Public Water Systems and the Truckee River in the Truckee Meadows*, which includes watershed profile descriptions and water quality data for the Truckee Meadows' tributaries to the Truckee River, is available on the Washoe County Clean Water website (Washoe County Clean Water 2021).

Climate in the Truckee Meadows is typical of Great Basin conditions. Summer months are hot and dry with average high temperatures of more than 90° Fahrenheit and an average of 1 inch of total precipitation. Winter months are cooler with average low temperatures below freezing, and winter months receive most of the year's precipitation in the form of snowfall (approximately 15 inches) (U.S. Climate Data 2021). Nevada is the driest state in the U.S., and the annual average total precipitation in the Truckee Meadows is approximately 7.35 inches (liquid precipitation), and the annual average snowfall is 22 inches (National Weather Service 2020) The Truckee Meadows is located in the rain shadow of the Sierra Nevada range, and snowfall around Lake Tahoe, averaging more than 200 inches annually, contributes a significant amount of water to the river. The Truckee River is the only outlet of Lake Tahoe, and other regional reservoirs within the Truckee River watershed contribute flow. The Truckee River supports a variety of riparian vegetation communities and provides habitat to support native species.

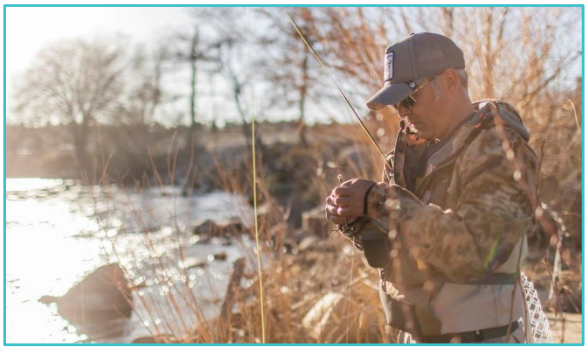
2.2.2 History

People have lived, traveled, gathered, hunted, and fished along the Truckee River and its tributaries for more than 10,000 years. The Truckee River is located on the ancestral lands of the Wa She Shu (Washoe) and Numu (Northern Paiute), whose descendants still consider it sacred. Members of the Reno Sparks

Indian Colony, the Washoe Tribe, and the Pyramid Lake Paiute Tribe continue to care for the river and its resources today. During the Gold Rush in the 1840s and 1850s, Reno-Sparks served as the preferred Truckee River crossing point for travelers on their way to California. Use of river water increased in 1859 to support the growing mining and agricultural needs after the discovery of the Comstock Lode. In 1903, the U.S. Bureau of Reclamation began work on the Newlands Project, which controlled flow from Lake Tahoe (via the Lake Tahoe Dam) and diverted water from the Truckee River watershed to the Lahontan Valley (Carson River watershed) for agricultural use.

The metropolitan area within the Truckee Meadows includes the cities of Reno and Sparks, which were founded in 1868 and 1904, respectively. The Truckee Meadows has experienced high population growth during recent decades. Washoe County (which includes the Truckee Meadows) has grown in population from 339,486 in 2000 to 473,606 in 2020 (Nevada Department of Taxation 2021). Truckee Meadows Regional Planning Agency (TMRPA) forecasts an average annual growth rate of 0.92% over the next 20 years, with an estimated 587,000 by 2042 (TMRPA 2021).

2.2.3 Beneficial Uses and Water Management



Currently, the Truckee River supports the municipal and agricultural designated beneficial use; generates hydroelectric power; provides recreational opportunities; and supports native plant and wildlife species, including the endangered cui-ui and threatened Lahontan cutthroat trout. A variety of federal, state, and local agencies manage the Truckee River under the Truckee River Operating Agreement (TROA), which governs water rights between stakeholders based on predicted available water. Finalized in 2015, TROA increased flexibility in water management between the TROA parties, including Nevada, California, the Truckee Meadows Water Authority, the U.S. Department of the Interior, and the Pyramid Lake Paiute Tribe. TROA increased efficiency of reservoir storage, allowing users to time the releases of water to meet demands for municipal supply, irrigation, and in-stream flows for fish and aquatic habitat.

3 GEOGRAPHIC SCOPE OF THIS PLAN

This Framework Plan covers an area extending from Crystal Peak Park through Vista Narrows and extends 600 feet from each side the Truckee River centerline. This area, referred in this Plan as the Project Area, aligns with the *One Truckee River Management Plan* (OTR 2016) and the *2020 Integrated Source Water and 319(h) Watershed Protection Plan for Public Water Systems and the Truckee River in the Truckee Meadows* (Washoe County Clean Water 2021) (Figures 1 and 2). Geographic jurisdictions and Tribal authorities considered in this effort consist of Washoe County, City of Reno, City of Sparks, Carson-Truckee Water Conservancy District (CTWCD), Reno-Sparks Indian Colony, Nevada State Lands, Nevada Division of Water Resources (NDWR), USACE, and Nevada Division of Environmental Protection (NDEP) Bureau of Water Pollution Control.

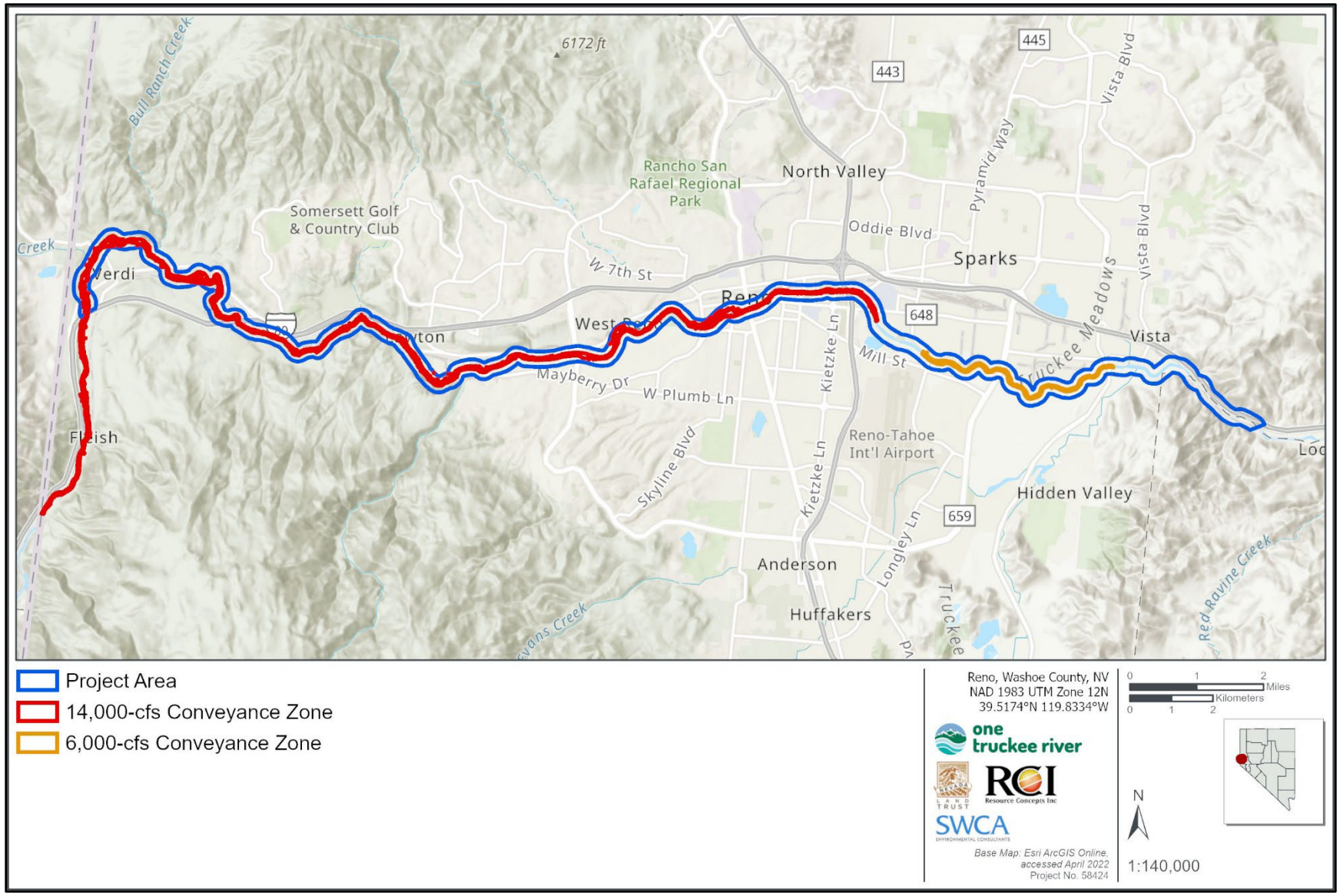


Figure 1. Project Area considered in the Framework Plan.

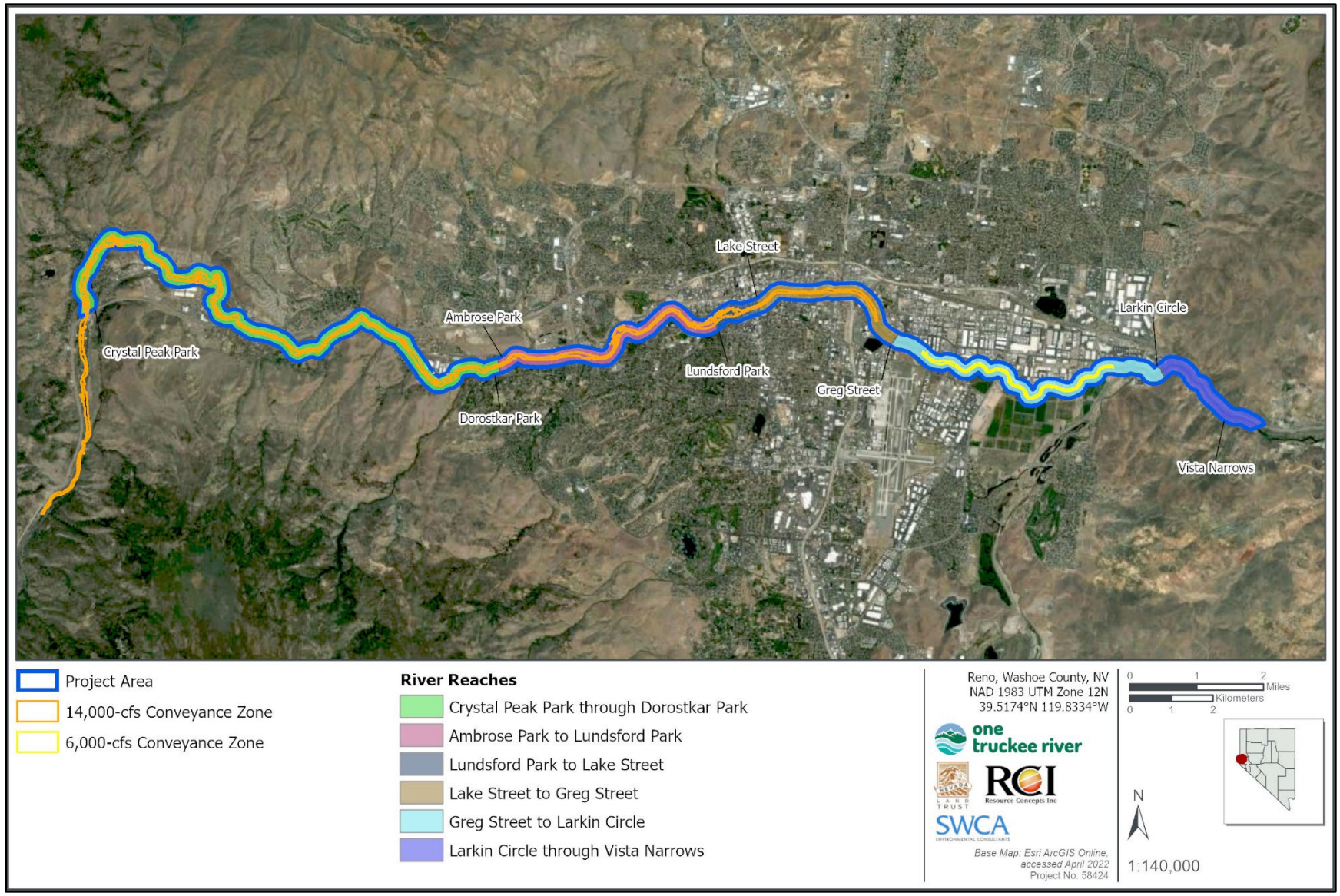


Figure 2. Truckee River reaches identified according to similarity in conditions (see Table 2 for detail).

3.1 River Reaches

To date, no formal river reaches have been established for vegetation management within the Project Area. OTR has identified generalized reaches within the Project Area to provide overall context for this Plan and to support future implementation-level planning (Table 2; see Figure 2). These reaches have variable ecological conditions, levels of residential, business, and industrial development; human use impacts; and vegetation structure.

Table 2. Conditions within Reaches of the Project Area

River Reach	General Conditions
Crystal Peak Park through Dorostkar Park	Relatively undeveloped riparian area Rural Some home development near the river; few homes directly on the river Few flood control structures (i.e., flood walls)
Ambrose Park to Lundsford Park	Suburban development Homes located directly along the river Private ownership of riparian zone
Lundsford Park to Lake Street	Highly urbanized segment of the river with concrete flood walls; includes the Kayak Park and the Riverwalk Area Dense urban development Small areas with native riparian vegetation High recreational use Fluctuations of unhoused individuals camping
Lake Street to Greg Street	Mixed-use residential/business Large stretches of industrial development on north side of river Fluctuations in unhoused individuals camping Change from management of 14,000-cfs and 6,000-cfs conveyance zones
Greg Street to Larkin Circle	Mostly undeveloped on south side of the river (City of Reno) Undeveloped greenbelt on the north side of the river (City of Sparks) with parks separating the river from areas of industrial and business development Fluctuations in unhoused individuals camping
Larkin Circle through Vista Narrows	Undeveloped river terrace Highly incised channel No riparian vegetation Area proposed for floodplain restoration (Truckee River Flood Management Authority Vista Narrows Project)

4 VISION FOR VEGETATION MANAGEMENT

A coordinated vision for vegetation management within the Project Area is needed to address Goal 3 of this Plan: Develop a vision for coordinated vegetation management within the Project Area that supports consistent management across jurisdictions (see Section 1.1).

OTR developed a vision statement for vegetation management based on the feedback provided by TWG members and stakeholders during TWG meeting #1. The development of the coordinated vision for vegetation management was collaborative and reflects deeper meaning than the simplified vision

statement below. Additional detail on vision keywords generated during the TWG's vision development are provided in Table 3.

Vision for Coordinated Vegetation Management along the Project Area:

Develop and implement a coordinated vegetation management strategy that supports a diverse and high-functioning riparian corridor that provides ecosystem services to sustain a clean, healthy, and resilient river that is a refuge for wildlife and all members of our community.

Table 3. Vision Development Activity Keywords (generated during technical working group meeting #1)

Ecosystem Services	Vegetation Community Characteristics	Needs for Practical Implementation	Vegetation Management Strategies	Protection and Refuge	Community Interactions
Shade	Large shade trees	Recognize ownership	Species makeup compatible with identifiable use	Greenway	Responsible
Cooling of urban heat island	Healthy understory	Low maintenance	Manage in zones	Protected areas	Respect
Protection of natural drainages	Multistory canopy	Too much freedom	Well planned	Quiet, can hear nature	Integrated
Oasis	Species diversity	Funding		A place of respite	Aesthetic
Drought resistant/low water use	Native species present	Buy-in and support from government agencies, nonprofits, commercial entities, and the community		Refuge	Relaxation, peace
Habitat	Varied, natural				Diverse, fun
Humans and wildlife	Healthy riparian habitat				Cohesive, shared, interwoven
Water and habitat	Age-class diversification				Diverse users
Abundant wildlife	Thick, diverse				Community driven
Climate resilient/resilience	Natural processes				Public access
Water purification	Healthy and vibrant				Accessible, myriad uses
Nutrient cycling	Consider flow restrictions for cottonwoods				Gathering spaces
Water quality					Planned recreation zones
Sustainable					Can stabilize access with boulders
Natural buffers between development and river					Wide greenbelt
Dedicated recreation areas and access to areas					Community engagement in implementation
Bank stabilized					Interpretation of restoration efforts
					Development along river supporting community to provide "eyes" along the river
					No camping
					Safe for wildlife and visitors
					Redevelopment meant to support low-income neighborhoods to access river

5 REGULATORY FRAMEWORK

The Regulatory Framework in Appendix A presents a compilation of regulations, codes, ordinances, permits, and guidance documents that are relevant to management of the Truckee River. Municipal codes include those from Washoe County, the City of Reno, and the City of Sparks, all of which have jurisdiction of some portions of the river within the Project Area. Regional planning documents from authors such as the Truckee River Flood Management Authority, NDEP, and private consultants are also included in Appendix A. Sources were evaluated for area of concern (e.g., flooding, vegetation), ownership or jurisdiction, flow stage jurisdiction, etc. A summary of each regulatory and guidance source (and notes on relevance to vegetation management) is provided in Appendix A.[4]

In addition to municipal codes, Washoe County, the City of Reno, and the City of Sparks all have their own respective master planning documents, and OTR intends to align the Framework Plan with the pertinent goals outlined in each of those documents.

The Washoe County master plan consists of sub-documents with different focus areas, the most applicable to the Framework Plan are the *Washoe County Regional Open Space and Natural Resource Management Plan* (Open Space Plan) (Washoe County 2008) and the *Washoe County Master Plan – Conservation Element* (Conservation Element) (Washoe County 2010). The Open Space Plan's Biodiversity Support section Goal 2) *Acquire and restore critical vegetation communities* and Goal 4) *Control invasive non-native species* in the region will be directly supported by OTR's Framework Plan. The Conservation Element goals supported by the Framework Plan are C 13.2.2 - *Preserve vegetated buffers along water resources and wetlands*, C 18.1 c. *Maintain and improve water quality for downstream users*, and C 18.1 d. *Maintain a healthy river environment, provide a recreation attraction for residents and tourists, and offer a focus for economic/tourism development*.

The City of Reno master plan (City of Reno 2021) contains many goals that will be supported by this Framework Plan, including the following:

- 2.5I Minimize the use of herbicides and neonicotinoid pesticides in favor of physical weed removal and other best management practices (BMPs).
- 3.2D Continue to improve views of pedestrian, bicycle, and boating/paddling access to and along the Truckee River as it travels through Downtown.
- 6.6B Encourage dialogue with under-served or under-represented groups or geographies when considering plans and decisions that affect them. Consider areas where there are disparities in access to services, public facilities, or other community benefits when prioritizing public investments.
- 7.2G Coordinate with local, regional, state, and federal agencies and government entities to ensure the development of corridors that extend across jurisdictional boundaries.

[4] Regulatory information described within this Framework Plan and in the Regulatory Framework Appendix A is included for information purposes only. OTR and NLT are not responsible for any errors or omissions, or for the results obtained from the use of this information. Therefore, users are advised to investigate information relevant to their project and to contact agencies directly for regulatory guidance.

- 7.6B Maintain all parks and publicly-owned spaces at a level that ensures the safe use of the space for its intended use and contributes to the quality of the surrounding development context.
- 7.6C Rehabilitate existing parks and other public spaces that are deteriorated and obsolete in order to meet safety and accessibility standards, reduce energy and water usage, and enhance maintenance efficiency.
- 7.7 Increase tree canopy and green infrastructure within the city. (City of Reno 2021)

The City of Sparks comprehensive plan (City of Sparks 2021) outlines resiliency and conservation goals that will be supported by this Framework Plan, including the following:

- Goal RC1: Conserve and protect natural resources needed to provide for current and future residents, businesses, and visitors.
- Goal RC5: Reduce the threats flooding poses to public safety and property.
- Policy RC2: Protect the water quality of the Truckee River, drainages, lakes, and aquifers.
- Policy RC10: Increase Sparks' urban tree canopy through the addition of trees in existing developed areas and by requiring trees in new developments.
- Policy RC12: Work with county, state, tribal, and federal agencies to minimize potential impacts to natural habitats and migration corridors. (City of Sparks 2021)

6 IMPLEMENTATION PLANNING GUIDE

This implementation planning guide is intended to be a step-by-step manual for planning an implementation-level restoration plan for the Project Area. The following sections lead users through the initial scoping steps (including application of a web map tool and regulatory framework tool) to identify jurisdictional constraints (i.e., regulations, codes/ordinances, and guidance documents) that apply to their project site and potential management opportunities that may exist for their project site.

Accompanying this plan is a Technique Compatibility Tool (Excel spreadsheet) that enables users to identify vegetation management techniques that are compatible with their project's jurisdictional constraints and that address their project's management opportunities. The compatibility tool is designed to help in development of implementation-level restoration plans.

Finally, using information and insights gleaned from the initial scoping steps, this planning guide leads users through on-site assessment steps (including ecological considerations), selection of vegetation species and vegetation management techniques, restoration design steps, permitting considerations, and preliminary cost estimate development (to inform final project implementation).

6.1 Scoping Steps

Scoping steps are completed at the beginning of a project and may occur during project visioning, during feasibility analysis, or during the proposal development phase. These steps identify, at a high level, project constraints and beneficial management opportunities.

6.1.1 Identifying Locational Jurisdictions

The first step in developing an implementation-level restoration plan for the Project Area is identifying the locational jurisdictions that apply to the project site because these jurisdictions will determine the

regulatory constraints for the area. A Washoe County Clean Water web map tool has been developed to help the user identify applicable locational jurisdictions. The Web Map Tool Instructions (below) explain how to access and use the web map tool.

For planning purposes, users should identify the following jurisdictions that apply to their project:

- Private vs. public land
- Federal or tribal jurisdiction (if applicable)
- State, city, or county jurisdiction (if applicable)
- Location inside or outside a regulated conveyance zone (i.e., 14,000-cfs or 6,000-cfs zone)

Washoe County Clean Water Web Map Tool Instructions

Use any internet browser to access the web map at this URL:
https://www.washoecountycleanwater.org (click on link for "Web Map Tool"):

The Washoe County Clean Water web map includes a Layer List on the right-hand pane where various layers can be toggled on and off. Relevant layers to consider for restoration include the following:

- Federal Emergency Management Agency 100-year flood zone
- Private and public parcels along the Truckee River corridor
- Individual ownership parcels (viewable if one zooms into the map)
- Flood conveyance boundaries
    - 6,000 cfs
    - 14,000 cfs
- Municipal jurisdiction boundaries
    - Reno City limits
    - Sparks City limits
    - Washoe County boundary
- Several map base imagery options

The web map has navigation tools in the right-hand corner of the map where users can zoom in or out, measure and select features, print map views, etc.

A secondary web map resource is available through the Washoe County Regional Mapping System (https://gis.washoecounty.us/wrms). This public mapping technology provides complementary information to that which is provided in the Washoe County Clean Water web map tool (described above).

6.1.2 Identifying Jurisdictional Constraints

Based on the locational jurisdictions that apply to the project site, users must consider the regulations, codes and ordinances, and guidance documents that apply to the project site. Specifically, users should review the Regulatory Framework in Appendix A to identify information that applies to their jurisdictions related to Truckee River water management; geographic information systems (GIS) data source information; regional planning documents; applicable laws, statutes, regulations, codes, ordinances, and plans, including federal, tribal, state, county, and city information; recovery plans for federally protected

species; and required permits (see Section 6.2.5 for more information on permits). This information in the Regulatory Framework identifies the constraints that may limit the vegetation species and techniques that can be applied to all or a portion of the project site. Note, users should reach out to relevant jurisdictions for the most up-to-date regulatory guidance that applies to the project site.

Jurisdictional constraints information has been integrated into the Technique Compatibility Tool (see Section 6.1.4), allowing users to quickly identify vegetation species and techniques that are compatible with the project site's constraints.

6.1.3 Identifying Management Opportunities

The next step in the scoping process is identifying the most important management opportunities for the project site. These opportunities are commonly the driving forces or reasons a project planner desires to restore the project site or may reflect additional benefits that may result from a project. These opportunities are also included as filtering criteria in the Technique Compatibility Tool (see Section 6.1.4), which further identifies specific vegetation management techniques that address these opportunities. **Those vegetation management techniques to address these opportunities are detailed in Appendix B**. Possible management opportunities that may be considered in planning a restoration project are described below.

- **Control foot traffic:** Foot traffic can damage existing vegetation and newly planted vegetation and can increase susceptibility of soils to erosion. Techniques to control foot traffic are needed to redirect human access to areas where it is appropriate and may include physical features of the restoration project (including methods to manage river access) but also community-level solutions to inform the public about appropriate river access.
- **Dissuade camping:** Camping can damage existing vegetation and inhibit establishment of new vegetation, eventually leading to project failure. Techniques to dissuade camping include many from physical features of a restoration project, community solutions, and strategic outreach to encourage positive river use.
- **Erosion mitigation:** Absence or poor establishment of vegetation is commonly the result of human activity along the river. Soil stabilization measures by vegetation and other physical erosion mitigation measures can help protect soils and water quality and support establishment and longevity of desirable vegetation.
- **Fire resistance:** In areas where wildfire is a concern, fire management should be considered in restoration planning efforts. In particular, establishment and maintenance of species that have some natural fire resistance is advisable.
- **Nitrogen reduction:** Establishment of emergent aquatic vegetation can promote nitrogen reduction through microbial activities in plant roots that volatilize nitrogen, thereby improving surface water quality of runoff entering the Truckee River.
- **Protection from wildlife damage:** Wildlife such as beavers and wild horses can damage existing vegetation or newly planted vegetation. Methods to protect plants from wildlife damage may help improve the survival of desirable vegetation.

- **Provide shade:** Areas where desirable trees do not exist along the riverbanks, or are in decline, are potential target areas where riparian trees could be reestablished to shade the river channel and mitigate elevated water temperature along the Project Area.
- **Provide sightlines and ease trash removal:** In some areas, understory woody vegetation such as shrubs can be problematic because it reduces sightlines (for public safety) and challenges trash removal. Strategies to promote low-growing vegetation (forbs and grasses) may be a solution to consider in these areas. The specific needs for maintaining sightlines will depend on site conditions, including the angle of the slope, location of other nearby visual obstructions, and distance to water.
- **Address soil limitations:** Rocky, eroded, exposed, compacted, or nutrient-depleted soils can limit growth of existing vegetation or newly planted vegetation. Identifying solutions to soil limitations will be essential to establishing and maintaining desirable vegetation.
- **Weed control:** Nonnative species can cause a nuisance to the project site and outcompete native or desirable vegetation. Selection of one or more weed management techniques (including integrated vegetation management strategies) should be explored to address the site's weed issues during both restoration implementation and maintenance phases. Where possible, it is advantageous to remove weeds upstream to downstream.
- **Create or enhance wetland and riparian habitat:** The river corridor is a place where native wetland and riparian vegetation can be created or enhanced to provide habitat for terrestrial and aquatic wildlife. Careful selection of species that are ecologically appropriate, fit within the project site's other constraints, and provide high habitat value are all important considerations.
- **Attracting pollinators:** Pollinators are key to maintaining biodiversity and creating healthy local ecosystems. When selecting plant species, focus on identifying opportunities to attract butterflies, bees, other insects, and birds with bloom periods throughout the growing season.
- **Native American traditional plant use:** Restoration provides an opportunity to propagate traditional use plants for personal, ceremonial, and non-commercial use by native cultural practitioners. Several traditional use plants for the Truckee River are identified in the *Memorandum of Agreement Among the USDI Bureau of Land Management, Carson City Field Office (BLM), The Nature Conservancy (TNC), Washoe County (County), Pyramid Lake Paiute Tribe (Pyramid), Washoe Tribe of Nevada and California (Washoe), and the Reno-Sparks Indian Colony (Colony) for Native American Traditional Plant Use at the Lockwood, Mustang and 102 Ranch Locations* (BLM et al. 2009).

6.1.4 Identifying Compatible Techniques

With a solid understanding of the jurisdictional constraints and management opportunities for a project (see previous sections), a user may begin identifying compatible vegetation management techniques. Accompanying this Framework Plan is the Technique Compatibility Tool (an Excel spreadsheet) that identifies potential vegetation species and other vegetation management techniques that are compatible with the project site and address a project's management opportunities. Included in the tool are filtering criteria for jurisdiction (i.e., the 14,000- and 6,000-cfs conveyance zones, City of Reno, City of Sparks, and Washoe County) and filtering criteria for the identified management opportunities (see descriptions of opportunities in Section 6.1.3).

The Technique Compatibility Tool does not take the place of the careful preparation of an implementation-level restoration plan (a process detailed in Section 6.2). However, the tool is meant to help generate potential ideas and solutions for vegetation management that meet a project's unique characteristics and can be refined during the restoration design and implementation planning process.

Technique Compatibility Tool Instructions

The Technique Compatibility Tool provides a quick and straightforward way to identify vegetation management techniques that will work within a project's applicable jurisdictional constraints and address its specified vegetation management opportunities.

The tool is built as an Excel workbook. There are multiple tabs in the workbook, as follows:

Instructions: This tab provides step-by-step instructions for applying the Technique Compatibility Tool.

Compatibility Tool: Select the jurisdictional constraints and vegetation management opportunities relevant to your project. Review the compatible vegetation management techniques.

Vegetation Management Matrix: Use this matrix for background and additional details on which techniques were identified as being compatible with your project.

Plant Characteristics: Matrix of plant information that informed tool development. This tab comprises source data. Do not alter the data on this tab unless you are authorized to update the underlying data for the tool.

Technique List: Abbreviated descriptions of the vegetation management techniques. Do not alter the data on this tab unless you are authorized to update the underlying data for the tool.

Tool Source Data: Provides the source data for the compatibility tool. Do not alter the data on this tab unless you are authorized to update the underlying data for the tool.

To use the Technique Compatibility Tool to identify compatible vegetation management techniques for your project, go to the Compatibility Tool tab of the workbook. Cell (H3), which is highlighted in yellow, contains a dropdown menu. Select all the jurisdictional constraints (these start with an underscore "_") and vegetation management opportunities (no underscore) that apply to your project. Generally, vegetation management opportunities are the objectives for the project, and the jurisdictional constraints are where they will be applied (see Sections 6.1.2 and 6.1.3 for details on opportunities and constraints). Once the jurisdictional constraints and management opportunities have been selected, the table and summaries below will update based on your selections.

To quickly narrow down the selection of the most compatible vegetation management techniques, there are two data summaries in Columns A and B of the Compatibility Tool tab. Column A displays the subset of the vegetation management techniques that are appropriate for all the jurisdictional constraints that were selected. Column B displays the subset of vegetation management techniques that address one or more of the selected vegetation management opportunities. If a vegetation management technique is listed in both Columns A and B, it is compatible with your project!

Want to dive in a little deeper? Check out which individual elements of your project were or were not compatible with each vegetation management technique in the table starting in Column D of the Compatibility Tool tab. Techniques that only appear in one column may require further investigation.

NOTE: Notable examples that warrant consideration for most projects are the 14,000- and 6,000-cfs conveyance zone. Any projects between the California-Nevada state line and the Glendale Avenue Bridge may encroach on the 14,000-cfs conveyance zone, at which point early coordination with the Carson-Truckee Water Conservancy District is advised so they can provide guidance on vegetation planting and restoration design. Any projects between the Glendale Avenue Bridge and the Pyramid Lake Paiute Tribe boundary may encroach on the 6,000-cfs conveyance zone, which is managed by the NDWR on behalf of the USACE. Planting vegetation of any kind within the 6,000-cfs zone will require 408 permissions from the USACE in close coordination with the NDWR. Users should see Appendix B for detailed guidance information on 14,000-cfs Zone Technique Compatibility and 6,000-cfs Zone Technique Compatibility. One notable nuance is that planting new trees within the 14,000-cfs conveyance zone may be constrained; however, tree replacement may be compatible in many cases (if approved by the Carson-Truckee Water Conservancy District).

Also note, the vegetation management techniques that apply to one or more of the selected constraints and opportunities are listed in Column F and are grouped by the Technique Category in Column D and Plant Growth Habit in Column E (if applicable). Relative cost of the technique (High, Medium, Low) is provided in Column G. The results in the columns to the right of Column G show the compatibility of the vegetation management techniques with each of the constraints and opportunities selected (1 indicates it is compatible, 0 indicates it is incompatible). Vegetation management techniques that do not match with any constraints or opportunities are not displayed.

Once you have obtained a list of compatible vegetation management techniques, move over to the Technique List tab. Look up your short list of compatible techniques to obtain more detail. The abbreviated technique descriptions are organized by category. More detailed descriptions of vegetation management techniques, including information about individual species, is provided in Appendix B of this Framework Plan.

6.2 Implementation Plan Development

After completing the scoping steps in Section 6.1, including identifying jurisdictional constraints and management opportunities, a restoration design and detailed implementation plan should be developed that is informed by existing and desired conditions at the project site. The restoration design drawings will prescribe specific locations for the selected vegetation management techniques (as generated following the steps in Section 6.1.4) throughout the site based on analyses of existing conditions. For example, the technique of "planting golden currant" at the project site may be identified by the Technique Compatibility Tool as appropriate given the jurisdictional constraints and management opportunities. Subsequently, the restoration design and implementation plan will prescribe the specific areas where golden currant will thrive.

The development of the restoration design and implementation plan will involve thorough analyses and planning. Careful planning before implementation of a restoration project will minimize the risks and potential costs of project failure. The implementation plan should describe the goals and objectives of the project, results of desktop and on-site assessments used to evaluate and design the project, design constraints, design approach, impact avoidance, permitting considerations, and the monitoring and maintenance plan. During implementation planning, topography, hydrology and hydraulics, soils, vegetation, and land use should be explored through desktop and on-site assessments. Data needs and

associated analyses are outlined below and follow recommendations in the integrated vegetation management plan prepared for Washoe County, including specific guidance relevant for riparian restoration (Resource Concepts, Inc 2020). Concepts and recommendations presented in the City of Reno Public Works vegetation management plan and the City of Reno Public Works integrated vegetation management plan are also included here (Resource Concepts, Inc 2017, 2019).

6.2.1 Desktop Assessment

A desktop assessment entails gathering the following existing information, especially spatial data, for the project site:

- **Topographic data** should be compiled and may consist of LiDAR-derived surfaces or contours and/or a survey by a professional land surveyor (PLS). Washoe County–commissioned bathymetric LiDAR is available through the U.S. Geological Survey National Map Viewer (https://viewer.nationalmap.gov/basic). Any project involving engineering or landscape architecture design will require a PLS survey.
- The anticipated **hydrology** of the Truckee River through the project site under TROA should be reviewed to understand the anticipated flow magnitude and seasonality under average, flood, and drought conditions. With knowledge of the topography and hydrology, the hydraulics of the project site can be modeled. 1-dimensional and 2-dimensional hydraulic models have been built and are used by the CTWCD and Truckee River Flood Management Authority to estimate areas of inundation, flow velocities, and flow depths throughout the project site. These models may be available upon request. Understanding the **hydraulics** of the project site will allow estimation of the frequency and depth of inundation for each stage elevation and locations that will be subject to high erosive forces. Depending on the location, the hydraulics of tributaries to the Truckee River may also be relevant for prescribing vegetation techniques.
- **Soil types** and characteristics influence available water, erosion, and overall site suitability for plants. Soil maps and reports (including soil map unit descriptions) are available through the Natural Resources Conservation Service Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx). Important soil characteristics to examine include soil texture, rock fragment size and density, thickness of various soil horizons, presence of salt or root-restricting horizons, and any relevant land management limitations. Ecological site descriptions, which are associated with soil map units, provide a general interpretation of conditions at the site and common plant communities that are suited to these conditions.
- Knowledge of the area's **management history** will inform the project planner about techniques that have or have not been successful in the past and historical land use that should be considered in the restoration planning effort. Discussions with current or prior land managers are recommended. Historical imagery can also be informative to understand site history, including the legacy of previous disturbance, which may affect the success of restoration efforts.
- Review potential **long-term plans** that agencies, such as local municipalities, the Truckee River Flood Management Authority, and business or improvement districts, have for the project site or the surrounding properties. Discussions with agency staff is recommended. Early and regular communication with agencies that will approve or permit a project is recommended. Early engagement of relevant agencies can save time and money because agency input may determine the feasibility of various aspects of a project. See Section 6.2.5 for detail on permitting considerations and agencies that may need to be engaged.

6.2.2 On-Site Assessment

The **on-site assessment** involves collecting additional information, often at a finer scale than the desktop assessment. Ideally an on-site assessment will be conducted by walking the project site and using either a GIS platform (e.g., tablet), map, or sketch to document the following:

- Gather **stakeholders** and relevant agency representatives (if appropriate) to discuss the existing and desired conditions and project planning and implementation considerations. Stakeholder and agency engagement may occur in one or more meetings, ideally on-site (if possible). During these meetings, participants should discuss the feasibility of potential vegetation management techniques to address management opportunities and work within regulatory constraints. Document all stakeholder input and collaborate with stakeholders to identify and clearly articulate goals and objectives of the project.
- Document the **ordinary high water mark (OHWM)**. Lichvar and McColley (2008) provide directions for delineating the OHWM and data sheets that can be used. The OHWM indicates the limits of jurisdiction for Nevada Divisions of State Lands and Section 404 of the Clean Water Act. If the OHWM is unclear, consultation with the Nevada Division of State Lands may be required. An aquatic resources delineation, which includes a professional OHWM delineation, may be required to determine if Section 404 of the Clean Water Act applies to the project if the project extends into wetlands or near a tributary or the Truckee River channel.
- Investigate the **ground cover** (vegetation cover, rock, pavement, bare soil), and mark sites with evident erosion. Record the slopes throughout the site.
- Document any significant **hydrological features** in or near the project site. For example, presence of tributaries or stormwater infrastructure should be identified and accounted for during the restoration design process.
- Map existing **plant communities** and dominant plant species. Document the tree, shrub, and herbaceous canopy cover. Are noxious and/or invasive weeds prevalent on-site or in adjacent parcels? What native, desirable plants are thriving or have limited distribution? Are multiple age classes of trees present? Has disturbance caused low plant cover in some areas? Do plant canopies shade the Truckee River?
- Soil map units and associated ecological sites (see desktop assessment, Section 6.2.1) are broad categories that should be refined by assessing **soil conditions** while on-site. If feasible, shallow soil pits should be excavated and described to document soil morphological characteristics (soil texture, color, structure, rock fragment size and density, plant roots, redoximorphic features, root-limiting layers, salts, etc.). These morphological characteristics can tell a story about the behavior of the soil and identify potential soil limitations. Soil testing can further inform any deficiencies or limitation in the soil (chemistry or physical characteristics), or confirm contamination suggested by management history.
- What is the current and future **land use** (e.g., trails, water access, fishing, camping), and does it vary throughout the site? Only techniques that are compatible with anticipated future land use should be prescribed. Land use should be an explicit discussion topic with stakeholders and land managers.
- How might **conditions in adjacent parcels** affect restoration and maintenance of the restoration project (e.g., noise, trash, high traffic, viewsheds)?

- Investigate **infrastructure**. Is there existing irrigation or are there opportunities for irrigation? Are there existing fences, utilities, or recreational amenities that should be considered in the design? Is there sufficient access for any heavy equipment or other specialized equipment to access the site, if required?
- Identify appropriate **reference conditions** to inform the selection of vegetation species and other management techniques. Reference conditions ideally reflect the soil, hydrologic, and other ecological characteristics at the project site. For more rural segments of the river, reference conditions may reflect natural riparian conditions. If reference conditions cannot be identified, select **desired conditions** based on past disturbance, land use, and other beneficial uses identified for the project. Desired conditions for more urbanized segments of the river may reflect only select habitat elements that are compatible with existing site conditions and the constraints of the urban environment.
- If improving **habitat** for wildlife is an objective of the project, the species that occur on the site or are desired on the site should be identified. How much wildlife habitat occurs across the site and in adjacent parcels? Can vegetation be restored or enhanced to support the current and desired wildlife species? Are there opportunities to increase biodiversity?
- Discuss with stakeholders **potentially available resources** (labor [including volunteers], plant materials, rock, soil, etc.) that are available on-site or that can be provided by project partners. Using existing resources can greatly reduce the cost of implementing a project.
- Identify any **long-term maintenance needs** that should be considered in the restoration design.

6.2.3 Restoration Design Preparation

Prepare restoration designs that are best suited to addressing the goals and objectives of the project to match the selected reference conditions and/or desired conditions that are compatible with the constraints of localized development and existing hydrology (see Section 6.2.2). Based on scoping and on the desktop and on-site assessments, select species and vegetation management techniques that match the conditions and ecological setting of the project site and address habitat needs of focal taxa. The chosen techniques and vegetation species can then be integrated into the restoration design.

Care should be taken to ensure the design identifies locations for each plant species where it is most likely to thrive and methods to increase the likelihood of survival (irrigation, plant protection, etc.). The Technique Compatibility Tool that accompanies this Framework Plan includes a plant characteristics spreadsheet that can be referenced to inform planting locations. For example, at lower elevations near the Truckee River, species that have medium to high inundation tolerance and low to medium drought tolerance will be appropriate. Native and nonnative plants are included in the potential techniques to inform planting plan development, but noxious plants were intentionally excluded. Note that projects falling under a USACE 404 Nationwide 13 or 27 permit are required to use only native plants. Selecting desirable species that are already thriving on the site is advised, or, if increasing plant species diversity is an objective of the project, selecting desirable species that are present in the project site or nearby but are underrepresented is advised.

The level of design needed will largely depend on the techniques to be applied. For example, projects where native plants will be established may only require simple planting plans that are drafted in GIS to identify the locations of larger plants, poles, and seed mix application. Note, the type of plant materials selected (large plants, poles, or seeds) will depend on each plant species' best propagation methods and availability of plant materials. More complex planting plans, or projects that need designs for recreational elements, should be drafted by a qualified landscape architect. More complex restoration designs, such as bank stabilization, bioengineering, or earthmoving projects, will require a qualified engineer to develop an engineered design and may require application of a hydraulic model.

Depending on the level of stakeholder involvement, permitting complexity, and agency requirements, conceptual designs for alternatives help to facilitate discussion of the benefits of each alternative before moving forward with a finalized design. An alternatives analysis to quantify the ability of each design to meet objectives, desired conditions, permitting considerations (Section 6.2.5), feasibility and constructability, sustainability, maintenance requirements, compatibility with future projects or phases, public support, and cost may be needed to select the alternative for implementation. Working through this conceptual design process may add time to the project timeline but will save time and money during implementation and maintenance.

Engineering and landscape architecture designs are commonly prepared in stages or milestones (e.g., conceptual, 30%, 60%, 90%, and 100%) to allow for feedback and discussion as more details are added to the designs. Most reviews for permits will require, at minimum, a 60% design. This allows for feedback from the regulatory agency and potential revisions to the designs before they are finalized. Cost estimates should accompany the 60% to 100% designs. For some projects, particularly those involving structures, value engineering may be incorporated at an early stage of the project to compare the cost of alternative designs. Some organizational procurement policies require development of an Engineer's Estimate of Cost and bid documents to accompany the request for bids. In these cases, engineering firms assist with requests for bids to select a construction contractor through support answering questions and providing more details or slight modifications to the design specifications. Alternatively, if consistent with an agency's procurement policy, design-build contracts that involve the construction contractor in design planning can reduce costs incurred from extensive development of specifications. Design-build contracts also allow valuable early input from contractors regarding constructability of a restoration project.

6.2.4 Implementation and Construction Planning

Implementation and construction planning should be undertaken in tandem with the restoration design process. As the restoration design takes shape, time should be taken to identify the materials and labor required to implement each design feature. Once the resources have been identified, potential sources of materials and labor can be identified, and coordination can begin in preparation of implementation and construction.

6.2.4.1 LABOR SOURCES

As part of the restoration design process (and prior to completing the final design), sources and types of labor should be identified, and the types of labor should align with the nature of work to be completed. Sources of labor will likely fall within three categories: 1) contract labor, 2) skilled and experienced volunteers, and 3) untrained volunteers. The most technical and complex of the restoration design, as well as any work requiring heavy equipment, will likely need to be completed by contract labor. Restoration techniques that require a level of familiarity and care can be completed by skilled and experienced volunteers, and any remaining work with less consequence can be completed by untrained volunteers.

Care should still be taken to properly train and supervise all groups of volunteers once they are on-site in order to provide the best opportunities for success.

6.2.4.2 PLANT MATERIALS PROCUREMENT

Implementation planning should include coordination with plant suppliers at least 1 year prior to breaking ground to ensure plants are mature enough to be installed. This process can begin once a plant palette for the project has been identified through the Technique Compatibility Tool and once further consideration has been made about which plants best support the local environment at the project site. The Washoe State Tree Nursery is a local option for plant cultivation. Local native seed suppliers should be contacted to find out about seed availability for the species of interest that is adapted for the project site and local climate conditions.

6.2.4.3 BIOENGINEERING AND CONSTRUCTION MATERIALS

Sources of bioengineering and construction will need to be identified in advance of construction. Some materials may be available through agency partners, and advance notice may be valuable in obtaining them. Many of these materials will likely need to be purchased; therefore, time will be required for sourcing and acquiring the materials if they are not locally available. Note that restoration design could change significantly between 30% and 60% restoration design, so firm plans for materials should not be made until at least 60% design.

6.2.4.4 ACCESS TO IRRIGATION

Many parks along the river corridor do not have irrigation or are at risk for vandalism of irrigation equipment. Understanding whether infrastructure exists to install temporary or permanent irrigation may influence what techniques are compatible with the project site. Some project sites may be able to accommodate gravity-fed systems with a water truck, whereas some may require pump-activated irrigation. The site location, human use, and restoration design will also be determining factors in choosing overhead or drip irrigation. Beginning conversations about irrigation early in the planning process will allow greater opportunity to design appropriate irrigation concurrently with the restoration design.

6.2.5 Permitting Considerations

The **permits** required for each project will vary. Working carefully through the scoping steps and reviewing in detail the Regulatory Framework (see Appendix A) will aid in identifying regulatory requirements. It is also advisable to engage regulatory agencies early in the project (as early as the scoping process) to get input on permitting, approvals, and project plans to avoid unexpected pitfalls.

Common permits or approvals that may be necessary for streambank restoration projects along the Truckee River are listed below.

- **14,000-cfs conveyance zone**. If the project is upstream of the Glendale Bridge (i.e., potentially within the 14,000-cfs conveyance zone), share project plans with the CTWCD. Depending on the type of activities proposed within the 14,000-cfs inundation zone, USACE Section 408 permitting may be required. Section 408 permitting is a time-consuming and often expensive process, in many cases requiring up to 2 years. If desired, the project may be designed to avoid this regulatory requirement. Early engagement with the CTWCD is advisable to understand

permitting requirements and alternatives. See Appendix B for more information on 14,000-cfs constraints and requirements.

- **6,000-cfs conveyance zone.** If the project is downstream of Glendale Bridge and within the 6,000-cfs inundation zone, an NDWR application for a Truckee River maintenance permit is required. Activities such as planting vegetation or earth-moving projects that are proposed within the 6,000-cfs inundation zone require USACE Section 408 permitting. Section 408 permitting is a time-consuming and often expensive process, in many cases requiring up to 2 years. Early engagement with the NDWR is advisable to avoid project delays, and projects proposed within the 6,000-cfs zone should account for the time and costs associated with 408 permitting. See Appendix B for more information on 6,000-cfs constraints and requirements.
- **OHWM.** If the project site is below the OHWM on the Truckee River, Nevada Division of State Lands regulations will apply, and an application to use state-owned lands will be required. The application should include a site plan with a scale and compass; the applicant's parcel, Assessor's Parcel Number (APN), and physical address, if any; both adjacent parcel's APNs; any existing littoral structures or improvements on the applicant's parcel; and any existing littoral structures or improvements on the two adjoining properties. Early engagement with the Nevada Division of State Lands is advisable to expedite project processing and approval.
- **Clean Water Act Section 404 and 401.** If discharge of fill (soil, rocks) will occur below the OHWM or within a jurisdictional wetland, Clean Water Act Section 404 and Clean Water Act Section 401 regulations will apply. The project may fall under a USACE Nationwide 404 Permit such as Nationwide Permit 13 for bank stabilization or Nationwide Permit 27 for aquatic habitat restoration, enhancement, and establishment activities. These nationwide permits require completion of aquatic resource delineations and detailed restoration plans that include best management practices. Clean Water Act Section 401 falls under the jurisdiction of NDEP, EPA, or tribes, depending on the location of the project. Early engagement with the USACE, NDEP, EPA, or tribes is advisable to identify the permitting needs for the project.
- **Working in Waterways Permit.** If any temporary work or routine maintenance will be occurring in surface waters, NDEP's Working in Waterways Permit is required. The application will require a notice of intent describing the project, equipment involved, and best management practices to be implemented.
- **Construction and dust control permits.** If the project will disturb more than 1 acre, an NDEP Construction Stormwater Permit and a Washoe County Dust Control Permit are required.
- **National Historic Preservation Act.** Do historical resources (i.e., human-made structures more than 50 years old) occur on the site? Section 106 of the National Historic Preservation Act requires an archaeological survey and cultural clearance of the project site. Hiring a qualified archaeologist early in the project can identify if such resources exist on the site, allowing this information to be considered in the design process.

6.2.5.1 PROGRAMMATIC PERMITTING OPPORTUNITIES

Given the time and expense associated with the USACE Section 408 permitting and some other permits, it may be worth pursuing a programmatic permit if the applicant expects to pursue multiple projects triggering this requirement. To pursue a programmatic permit through the 408 process, all project sites and project activities will need to be defined, and the applicant(s) will need to demonstrate if the maximum impact of the project will impair usefulness of the authorized federal conveyance project.

6.2.6 Monitoring and Maintenance Considerations

Requirements for **monitoring and maintenance** of the project site should be incorporated into the implementation-level restoration plan and work in concert with the restoration design. Routine maintenance will be necessary along the Project Area, including irrigation and watering, weed treatment, replanting or reseeding, reinstallation of fences or plant protection, and vegetation trimming and removal. Maintenance needs should be clearly communicated in the implementation-level restoration plan. The amount of maintenance required during the first 1 to 2 years after implementation is generally greater than the long-term maintenance requirements.

At a minimum, regular qualitative monitoring (as described in a monitoring plan portion of the implementation plan) is necessary to identify maintenance and management needs. Monitoring plans may include repeat photograph points; monitoring of noxious weeds, plant survival, and disturbance; or wildlife surveys. Ideally, monitoring parameters will be designed to directly measure success related to goals and objectives of the project.

6.2.7 Preliminary Cost Estimation

Cost estimation is integral to the restoration design process; however, funding and budget timelines often require early ballpark estimates for long-term planning. The cost of planning and permitting, materials (e.g., plants, herbicides, rock, erosion control fabric), mobilization, equipment, labor, monitoring, and maintenance should be included in cost estimates (Table 4). Running the Technique Compatibility Tool and referencing the relative cost of appropriate techniques will aid practitioners in estimating cost. As implementation planning and designs progress, the area specified for each technique will allow more precise cost estimation.

Although the average cost of restoration implementation has been analyzed and published, restoration in an urban setting requires different considerations due to heavy human use, higher costs of stakeholder engagement and permitting, and the need for community outreach and engagement to support project success. Daniels et al. (2016) analyzed costs for forest restoration projects in Seattle, Washington, to provide per-acre costs of weed control, planting, trail work, and monitoring based on projects implemented from 2011 and 2013. A similar analysis may be developed for restoration projects along the Project Area as more projects are implemented.

Table 4. Cost Estimate Categories and Descriptions

Category	Item	Description
Project management	Time for project management by all team leads	Adequate project management time for all project phases (planning, permitting, construction, and ongoing maintenance)
Planning and permitting	Stakeholder engagement	Communications with stakeholders (meetings, publications)
	Implementation plan and designs	Cost of preparing and reviewing plan and designs
	Permitting	Cost of agency coordination and permitting process

Category	Item	Description
Materials	Plants	Per-plant cost based on area and planting density
	Weed treatment	Materials and supplies for weed treatment
	Erosion control fabric	Type of fabric and area to be installed
	Soil amendments	Volume of amendment (e.g., straw, polymer)
	Rock	Rock sizing, specifications, and volume
	Signs	Number of signs, cost to design and manufacture
	Storage	Trailer or fencing to secure equipment and materials
	Trail materials	Materials or supplies for building designated trails
	Irrigation equipment	Tubing and emitters for irrigation during and after implementation
	Other bioengineering materials	Other types of bioengineering materials depending on restoration design, such as boulders, riprap, erosion control fabric, etc.
Mobilization		Mobilizing equipment and materials to and from site or temporary on-site storage
Equipment	Heavy equipment	Excavator, water truck, skidsteer, etc. Daily or weekly rate
	Light vehicles	Trucks to transport materials and personnel
	Trailers	Trailers to transport materials, tools, and equipment
	Tools	Augers, shovels, etc.
Agency general support		Overhead fees for agency costs such as printing, tele-communication, and insurance
Labor	Supervisory staff	Staff needed to supervise phases of design and implementation
	Construction manager	If heavy equipment required, manager of construction equipment and crew
	Operators	Heavy equipment operators
	Laborers or volunteers	Labor to conduct work not requiring specialized tools or equipment (could include planting, ground preparation, and weed treatment), including training time if needed; volunteer labor may save project costs, but the efficacy of volunteer labor is highly variable; supervisory oversight of all labor sources (paid or volunteer) is highly recommended.
Monitoring	Monitoring before and after implementation	Staff and materials needed to implement monitoring plan prescribed in implementation plan
Maintenance	Irrigation	Operation of irrigation, especially 2 years after implementation
	Weed control	Removal of weeds, especially 2 years after implementation
	Plant protection	Installation or reinstallation of plant protection
	Plant maintenance	Trimming, etc.
	Contingency funding and resources	Resources (funding or materials) to cover replacement of plants or other restoration materials.

7 CONCLUSIONS

This Framework Plan is intended to be a resource for entities considering or actively exploring opportunities to plan and implement vegetation management and restoration plans within the Project Area. This Plan aims to clarify the various regulatory constraints and guidance documents that influence vegetation management within the Project Area (see Section 5 and Appendix B). The document and support tools are further designed to outline an approach to plan restoration projects (Section 6) and to identify tools and techniques that are compatible with the regulatory constraints and guidance documents (see the Technique Compatibility Tool and Appendix B). OTR and Nevada Land Trust anticipate that this Framework Plan and tools will evolve and change through time in response to implementation of pilot restoration projects within the Project Area. OTR will alert relevant stakeholders and TWG member as the Plan and tools are revised.

8 LITERATURE CITED

Bureau of Land Management, Carson City Field Office (BLM); The Nature Conservancy; Washoe County; Pyramid Lake Paiute Tribe; Washoe Tribe of Nevada and California; and Reno-Sparks Indian Colony. 2009. *Memorandum of Agreement Among the USDI Bureau of Land Management, Carson City Field Office (BLM), The Nature Conservancy (TNC), Washoe County (County), Pyramid Lake Paiute Tribe (Pyramid), Washoe Tribe of Nevada and California (Washoe), and the Reno-Sparks Indian Colony (Colony) for Native American Traditional Plant Use at the Lockwood, Mustang and 102 Ranch Locations*. Signed February 17, 2009.

City of Boulder. 2020. *City of Boulder Flood Management Program*. Available at: https://bouldercolorado.gov/sites/default/files/2021-04/floodmanagementprogramoverview2020.pdf. Accessed November 12, 2021.

City of Reno. 2021. *Reimagine Reno: The City of Reno Master Plan*. Available at: http://www.reimaginereno.us/. Accessed April 2022.

City of Sparks. 2021. *Comprehensive Plan: The Plan Guiding the City of Sparks to the Year 2030.* Available at: https://cms7files1.revize.com/sparksnv/Document_Center/Department/Planning%20&%20Zoning/Sparks%20Comprehensive%20Plan_Full%20Plan_2021.03.08.pdf. Accessed April 12, 2022.

Daniels, J.M., W. Brinkley, and M.D. Paruszkiewicz. 2016. Urban forest restoration cost modeling: a Seattle natural areas case study. *Gen. Tech. Rep. PNW-GTR-921.* Portland, Oregon: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Gann G.D., T. McDonald, B. Walder, J. Aronson, C.R. Nelson, J. Jonson, J.G. Hallett, C. Eisenberg, M.R. Guariguata, J. Liu, F. Hua, C. Echeverria, E.K. Gonzales, N. Shaw, K. Decleer, and K.W. Dixon. 2019. International principles and standards for the practice of ecological restoration. Second edition. *Restoration Ecology* S1-S46.

Lichvar, R.W., and S.M. McColley. 2008. *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States: A Delineation Manual*. Hanover, New Hampshire: Engineer Research and Development Center.

National Weather Service. 2020. NOAA Online Weather Data. Available at: https://www.weather.gov/wrh/Climate?wfo=rev. Accessed April 12, 2022.

Nevada Department of Taxation. 2021. Certified Population Estimates of Nevada's Counties, Cities and Towns 2000 to 2020. Available at: https://tax.nv.gov/uploadedFiles/taxnvgov/Content/Tax Library/Final%20Popul%20of%20Nevada's%20Counties%20and%20Incorp%20Cities%20and%20Unincorporated%20Towns%202020%20for%20Certification.pdf. Accessed on November 9, 2021.

One Truckee River (OTR). 2016. *One Truckee River Management Plan*. Available at: https://www.onetruckeeriver.org/plans-and-reports. Accessed on: November 10, 2021.

Resource Concepts, Inc. 2017. *City of Reno Public Works Vegetation Management Plan, Phase 1: Current Program Description and Recommendations*. Prepared for City of Reno Public Works.

———. 2019. *City of Reno Public Works Integrated Vegetation Management*. Prepared for City of Reno Public Works.

———. 2020. *Regional Parks and Open Space Integrated Vegetation Management Plan*. Prepared for Washoe County Regional Parks and Open Space.

Truckee Meadows Regional Planning Authority (TMRPA). 2021. *Truckee Meadows Annual Report*. Available at: https://tmrpa.org/tmar/. Accessed on November 9, 2021.

Truckee Meadows Water Authority. 2020. *2020-2040 Water Resource Plan.* Available at: https://tmwa.com/wp-content/uploads/2020/11/TMWA-WRP-2020-Final.pdf. Accessed April 12 2022.

U.S. Army Corps of Engineers (USACE). 1964. *Operation and Maintenance Manual for the Truckee River and Tributaries (California and Nevada).* Sacramento, California: Department of the Army, Sacramento District.

———. 1973. *1973 Martis Creek Lake Operation and Maintenance Manual for the Truckee River.* Sacramento, California: Department of the Army, Sacramento District.

U.S. Climate Data. 2021. Climate in the United States. Available at: https://www.usclimatedata.com/. Accessed October 21, 2021.

Washoe County Clean Water. 2021. 2020 Integrated Source Water and 319(h) Watershed Protection Plan for Public Water Systems and the Truckee River in the Truckee Meadows. Available at: https://www.rci-nv.com/photos/2020/09/b.Program_Overview.pdf. Accessed November 9, 2021.

Washoe County. 2008. *Regional Open Space and Natural Resource Management Plan*. Available at: https://www.washoecounty.gov/csd/planning_and_development/master-plan-zoning/files/os_plan_081908.pdf. Accessed April 11, 2022.

———. 2010. *Master Plan: Conservation Element.* Available at: https://www.washoecounty.gov/csd/planning_and_development/master-plan-zoning/files/conservation_element_maps.pdf. Accessed April 11, 2022.

9 ACKNOWLEDGEMENTS

This work was generously funded by the U.S. Bureau of Reclamation's WaterSMART Grant Program (Agreement #R19AP00244).

Completion of this Framework Plan and the future projects that will result from it would not have been possible without the participation and dedication of TWG members, stakeholders, and other contributors who generously provided their expertise to developing this plan (see list in Table 1).

APPENDIX A

Regulatory Framework

REGULATORY FRAMEWORK

This appendix includes specific information on the regulatory constraints and jurisdictions along the Truckee River[5]. Figure A-1 illustrates typical jurisdiction along a typical Truckee River cross section (One Truckee River 2021). The Excel table that accompanies this appendix summarizes the regulatory framework for the Truckee River (as described in Section 5 of the *One Truckee River Framework Vegetation Management and Restoration Plan* [SWCA Environmental Consultants 2021]).

[5] Regulatory information described in Appendix A was considered complete and comprehensive by the One Truckee River and Nevada Land Trust at the date of publication. However, regulations and their interpretations may have changed following publication. Therefore, users are advised to investigate information relevant to their project and to contact agencies directly for regulatory guidance.

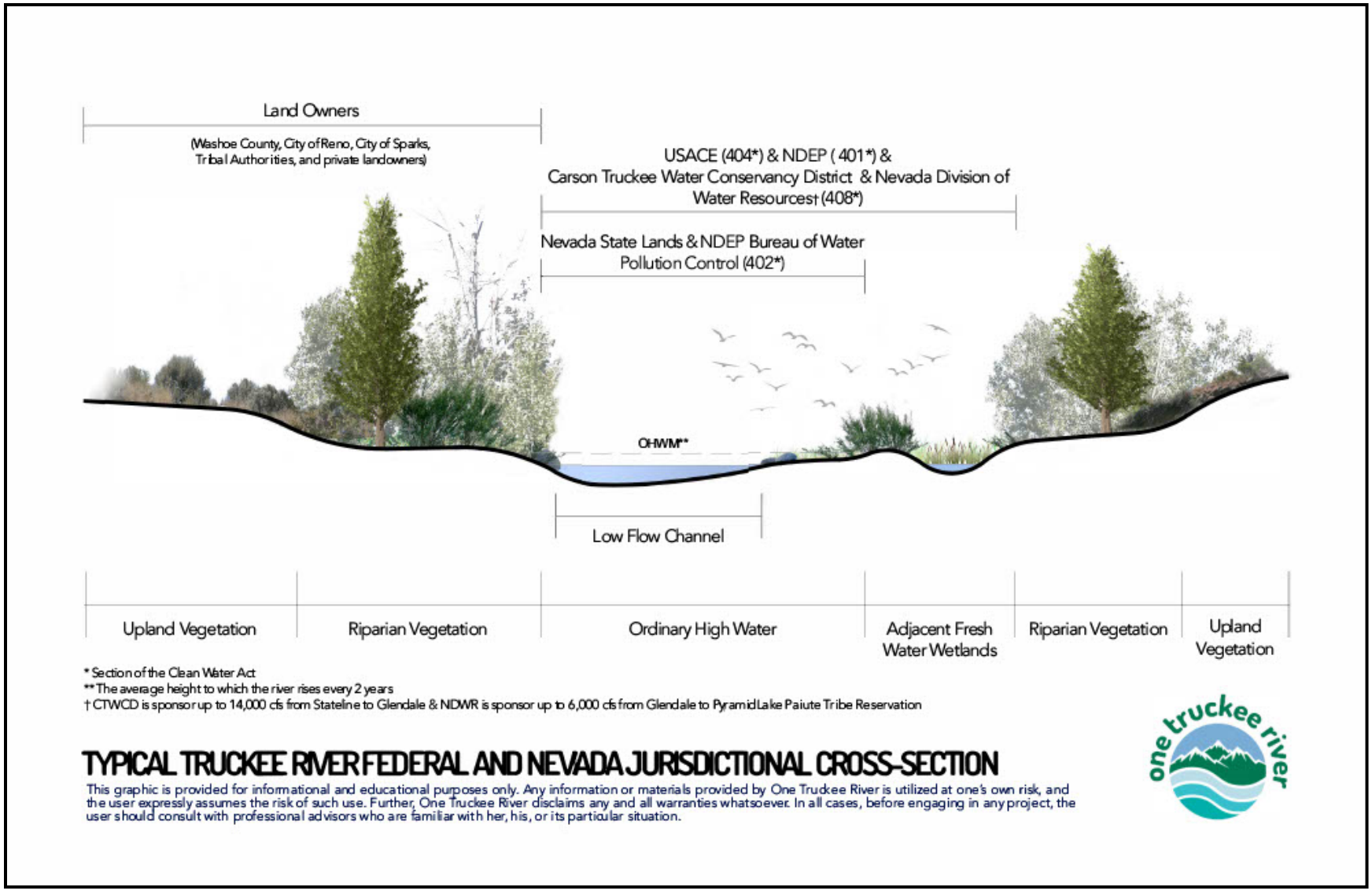


Figure A-1. Typical jurisdiction along a typical Truckee River cross section within Nevada (One Truckee River 2021).

LITERATURE CITED

One Truckee River. 2021. *Truckee River Jurisdiction Cross-Section*. Published October 28, 2021.

SWCA Environmental Consultants. 2021. *One Truckee River Framework Vegetation Management and Restoration Plan*. Prepared for One Truckee River and Nevada Land Trust. Reno, Nevada: SWCA.

This page intentionally left blank.

APPENDIX B

VEGETATION MANAGEMENT TECHNIQUES

CONTENTS

VEGETATION MANAGEMENT TECHNIQUES

The following sections detail the various vegetation management techniques that appear in the Technique Compatibility Tool (see Excel spreadsheet accompanying this document). The tool helps users identify potential vegetation species and other vegetation management techniques that are compatible with the project site's jurisdictional constraints and address the project's management opportunities. In particular, the tool will allow an entity flexibility and discretion in choosing those techniques that meet their goals, objectives, and directives.

ALL CATEGORIES

Phased Project Approach

Implement small-scale projects in which various strategies to address the project site's challenges and needs can be applied and tested for future projects or later project phases. Project phasing may also allow project costs to be incurred over a longer time period to match funding sources.

Increase Communication Across Jurisdictional Departments

Many different agencies have authority over the Truckee River and its banks. In addition, within each agency, there may be different departments working on different topics within the same geographical space along the Truckee River, including parks and recreation, public works, public utilities, police departments, and human service outreach teams. Because these departments have unique tasks, they all potentially can consciously or unconsciously influence each other's work in positive or negative ways. To support the success of restoration and vegetation management efforts along the Truckee River, it is important to take the extra time to communicate, consider, and adjust (when feasible) the different departments' needs, considerations, and concerns as they related to vegetation within the specific geographical area where they work.

CONVEYANCE

Tree Removal

The presence of trees in floodplains affects water conveyance by introducing flow resistance, and factors such as stem flexibility and the extent of vegetation also influence flow velocity. The removal of trees from waterways increases flow conveyance and mitigates flood risk. Tree removal may also be prescribed where hazard trees present a public safety concern. Removal of trees should be selective to preserve ecological function, and management strategies such as retaining tree stumps to prevent erosion should be implemented. Removal of hazard trees may provide an opportunity for tree replacement even within the regulated flood conveyance zones (see below). In some cases with agency approval, felled trees may be used as natural materials for engineered bank stabilization structures.

For more information, see Shih and Chen (2021).

14,000-cfs Zone Technique Compatibility

The *Martis Creek Lake Operation and Maintenance Manual for the Truckee River* (U.S. Army Corps of Engineers [USACE] 1973) (known as the "Martis Agreement") sets forth the specific parameters for Truckee River channel conveyance capacity maintenance from the Nevada-California state line downstream to the Glendale Avenue Bridge. Under this agreement with the USACE, the Carson-Truckee Water Conservancy District (CTWCD) maintains the 14,000-cubic-feet-per-second (cfs) conveyance capacity in the Truckee River based upon assurances from Washoe County and the City of Reno that they will maintain their reaches of the river. In conjunction with its duty to maintain a minimum channel capacity in this stretch of the Truckee River, the CTWCD reviews applications for river channel encroachment permits to ensure no encroachments are made to the river channel that will interfere with the minimum conveyance capacity.

To ensure 14,000-cfs conveyance, the CTWCD reviews plans for planting vegetation species (for new construction or projects that require permits) and inspects existing vegetation along the river that may require management interventions. The CTWCD's inspections focus on identifying vegetation and debris to be cleared within the 14,000-cfs zone, including 1) large trees that are dead or with a likelihood of ending up in the river, or trees already down in the flood channel, and 2) revetments that must remain clear of vegetation (Booth Bridge, Riverside Drive, White Water Park, new vegetation in the river on deposits, etc.).

The CTWCD has jurisdiction to approve bank stabilization projects that establish and/or maintain vegetation that serves the purpose of erosion control. Early coordination with the CTWCD is highly advised so that the CTWCD can provide input and guidance on vegetation planting and restoration design. Based on guidance provided by the CTWCD, vegetation management techniques that are, in most cases, compatible within the 14,000-cfs zone include the following:

- Healthy trees that are already established in the flood channel
- Establishment of young, healthy trees when they are replacing dead or declining trees
- Low-lying vegetation
- Herbaceous vegetation
- Shrubs that bend over when under moving water (i.e., coyote willow [*Salix exigua*])
- Shrubs that lose foliage and that do not get big and woody/stiff (i.e., do not collect debris/grass)
- Shrubs that bend over and do not capture material

The CTWCD supports removal of dead, woody vegetation (which is a potential debris that could restrict conveyance) and replacing it with healthy, compatible vegetation. For example, removal of one dead tree could be replaced with one healthy tree (1:1 replacement) near the original tree.

Cottonwoods trees (*Populus* sp.) require special consideration as replacement trees near the river channel because they have a soft wood with poor durability and are commonly targeted by beaver activity. Dead or dying cottonwood trees commonly land in the river channel, thereby becoming debris that restricts conveyance. If selected for a project, cottonwood trees should be placed in an appropriate location (i.e., sites with suitable soil and water table conditions) and adequately maintained (e.g., trimming of dead or damaged branches, protected from beaver damage).

6,000-cfs Zone Technique Compatibility

The Nevada Division of Water Resources (NDWR) maintains the 6,000-cfs zone of the river from Glendale to the Pyramid Lake Paiute Tribe (PLPT) boundary on behalf of the USACE. It is important to clarify that although the Truckee River is managed to 6,000 cfs between Glendale and the PLPT boundary, the conveyance zone itself stretches out from the centerline of the river to the banks. The extent of the 6,000-cfs zone onto the banks varies throughout the management corridor. Planting vegetation of any kind within the 6,000-cfs zone or its improvements (e.g., riprap or levees) will require a 408 review from the USACE in close coordination with the NDWR (see Section 6.2.5 of the main report for details). Project work that occurs outside the 6,000-cfs zone in the corridor does not require a 408 permit. If a project proposes work partially in and partially out of the conveyance zone or improvements, only the work within those areas will require a 408 permit.

Through the 408 permitting process, an applicant will need to demonstrate (through hydraulic modeling) that the maximum impact of the project will not impair the usefulness of the 6,000-cfs conveyance zone. For example, hydraulic modeling will be required to illustrate the maximum impact of terrain modifications (import or export of material or grading within the authorized channel) and any planting of vegetation or installation of habitat features (typically modeled through manipulation of hydraulic roughness values). Examples of compatible vegetation that could be considered within the 6,000-cfs zone include the following:

- Healthy trees that are already established in the flood channel
- Low-lying vegetation
- Herbaceous vegetation
- Shrubs that bend over when under moving water (i.e., coyote willow)
- Shrubs that lose foliage and that do not get big and woody/stiff (i.e., do not collect debris/grass)
- Shrubs that bend over and do not capture material

The NDWR supports removal of dead, woody vegetation (which is a potential debris that could restrict conveyance). Any vegetation replacing previously dead vegetation is subject to 408 permissions.

VEGETATION SPECIES (see Technique Compatibility Tool)

See the vegetation species to be planted in the Technique Compatibility Tool.

VEGETATION MAINTENANCE

Trim Herbaceous Plants

Trimming perennial herbaceous plants can reduce plant density to allow more air and sun to reach the plant; remove weak and thin stems; increase the health of the plant by providing more energy to less plant matter; and encourage new stem growth, better branch structure, and better overall health. Herbaceous plant trimming is also a strategy to ensure sightlines can be maintained where needed. Pruning should also be completed to remove dead, broken, or crossing limbs; diseased branches; or branches damaged by

insects (Robinson et al. 2013). Only less than 1/4 of the canopy should be removed from perennial plants, or less than 1/3 of the stems should be removed annually (Kelley et al. 2007).

Information on trimming herbaceous plants can be found online through University of Nevada, Reno (UNR) Extension (Robinson et al. 2013).

Trim Shrubs

Crown cleaning includes removing dead limbs, diseased limbs, insect damaged limbs, and suckers sprouting near the base of the shrub. Thinning the canopy will help keep shrubs healthy. Shrub trimming is also a strategy to ensure sightlines can be maintained (where needed) and to further address flood conveyance requirements. Trimming should be performed during dormancy in late winter or early spring; pruning in the heat of summer will put new growth at risk of burning and dying (Robinson et al. 2013). No more than 1/4 of the plant's mass should be removed annually (Kelley et al. 2007).

Information on trimming shrubs can be found online through University of Nevada, Reno Extension (Robinson et al. 2013).

Trim Trees

Trimming or pruning trees helps manage canopy cover, decreases competition between individual trees, removes suckers, and further addresses dead or broken limbs that are hazards to public safety (Robinson et al. 2013). Tree trimming is also a strategy to ensure sightlines can be maintained (where needed) and to further address flood conveyance requirements. Trees should be trimmed while the plant is dormant, usually between late fall and early spring. Trimming during dormancy decreases the risk of infection from the damage and preserves energy for the growing season. Trim side branches when they are between 1 and 3 inches in diameter, and never remove more than 1/4 of the canopy or 1/3 of the height of the tree to protect tree health (Stewards of our Streams 2002). Chainsaws and other equipment may be required. Topping trees is an unhealthy practice that leaves them susceptible to disease, pests, and structural damage and is not allowed within the City of Reno.

Irrigation and Supplemental Watering

Some riparian plants that are not planted directly into the water table may require supplemental water to aid in establishment. Irrigation (e.g., drips, sprinklers) or more manual methods such as embedded watering tubes for deep watering (example at Bainbridge 2014) may be applicable. The complexity of human use at the project site should be carefully considered in irrigation planning. For example, automatic irrigation equipment may be at risk of vandalism in some areas. However, manual watering strategies are time intensive and require reliable staff or volunteers committed to a regular water schedule, which could support more people to watch and care for the area. Water could be pumped from the Truckee River for irrigation or could be sourced from municipal water supply. In some cases, passive gravity systems can be designed for temporary irrigation via a water truck

or other water source. **Note, landowner water rights should be verified before using Truckee River water for irrigation. Arrangements with the Truckee Meadows Water Authority may be needed if municipal water is to be used for irrigation.**

If using seeding within the restoration design, put in spring seeds and install them following a storm. Otherwise, irrigation should be considered in the planning process.

For more information about irrigating in riparian areas, please refer to the *Guidelines for Planning Riparian Restoration in the Southwest* (Natural Resources Conservation Service [NRCS] n.d. [2021]).

Plant Protection: Cages

Install chicken wire or other fine-mesh wire fencing around plants to protect them from beaver or rodent activity. For trees, cages should be approximately 3 feet high and have approximately 6 inches between the fence and the plant to leave room for plant growth (Lake Barcroft 2013). To protect smaller plants from ungulate browsing, cages can be placed around the entire plant with enough room to allow for plant growth. Caging can be made of a material that will rust and degrade over time instead of potentially restricting a plant's growth. Galvanized fencing may also be used in areas where plants will be monitored.

Plant Protection: Paint and Sand Application

A thick coat of latex paint, ideally with sand mixed in or applied while the paint is wet, can be applied approximately 4 feet high to tree trunks to deter beaver grazing (Lake Barcroft 2013). Paint can be applied to larger, mature trees where caging would be impractical. Painted trees should be monitored, and paint can be reapplied if it starts to wear.

Rock Removal

Newly planted vegetation generally needs some fine-grained soil for establishment. Rocks and boulders can be removed strategically to create areas where fine-gained soil can be added to support revegetation. A buffer of riparian vegetation can protect against erosion similarly in place of rock cover. Plantings can be placed among boulders to retain erosion protection but also increase ecosystem function.

Angular riprap is a commonly used method to discourage human use. It is important to note that angular fractured rock (commonly used as riprap) commonly has sharp edges and can be a safety concern (in some cases), creating a hindrance to recreational access and river rescue operations.

Techniques for revegetating riprap revetments are available in *Techniques for Vegetating Riprap Revetments* (Juneau Watershed Partnership n.d. [2021]).

WEED CONTROL

If weeds establish in a revegetated area, native plants may be outcompeted for water, sun, and soil nutrients. Noxious weeds especially should be controlled because they can cause more serious impacts to native vegetation, soil properties, wildlife, and ecosystems in general. See the Nevada Noxious Weed List for a list of species (Nevada Department of Agriculture 2021).

During revegetation activities, care should be taken to 1) not introduce new weeds by the spread of seeds on equipment and 2) minimize soil disturbance, which can encourage the establishment of some weed species. Integrated vegetation management (IVM) is the practice of promoting stable, desirable plant communities (primarily natives) to prevent weed invasion and soil erosion and reducing the level of required maintenance (University of Nevada, Reno 2022). IVM methods can include a combination of cultural (grazing, native plant establishment, etc.), biological, manual, mechanical, and herbicide treatments (Resource Concepts, Inc. 2017, 2019, 2020). Where possible, it is also advantageous to remove weeds starting upstream then moving downstream.

Manual Weed Removal

Annual and tap-rooted weed species are good candidates for manual weed removal. Ideally, weeds are hand pulled at first appearance to prevent establishment of a population. Infestations of weeds can also be hand pulled, but populations may be more difficult to control at this stage. Hand pulling should occur before the weed plants are seeding to prevent the spread of seeds. Hand pulling of weeds is also a good volunteer opportunity, in which members of the community can have a significant impact through manual weed removal in a short amount of time. Involving volunteers in this work can also reduce the need for chemical weed control by being able to cover larger areas in shorter periods of time.

Mechanical Weed Removal

Mechanical weed removal requires the use of equipment. Methods include mowing, cutting, and weed eating, which primarily remove aboveground vegetation to reduce weed growth and seed production. These methods should only be used for species that do not aggressively resprout after damage and should not be performed while plants are seeding.

More information on mechanical weed removal can be found in Chapter 1 of The Nature Conservancy's *Weed Control Methods Handbook: Tools & Techniques for Use in Natural Areas* (Tu et al. 2001).

Prescriptive Grazing

Managing livestock grazing in riparian areas preserves riparian vegetation communities and reduces streambank erosion. Additionally, sheep and goats can be allowed to graze in riparian areas. Sheep and goats will forage on weedy species and cause less compaction and erosion to streambanks than cattle. Local companies may be available to contract weed control using sheep and goats.

Chemical Weed Control

Herbicides may be used to kill existing weed infestations or may be applied to a planting area to prevent weeds from establishing. Herbicides should be used cautiously to prevent impacts to desirable plants and toxicity to animals. Only U.S. Environmental Protection Agency (EPA)–approved aquatic herbicides (EPA 2021) should be applied near the Truckee River. Local jurisdictions may also have approved herbicide lists that are specific to that municipality. Within the Truckee River corridor, other weed treatment methods should be considered before applying chemical treatments to prevent impacts to water quality.

Plant Fast-Growing Native Species

In project sites without weeds or where weeds have been removed, fast-growing native species may be planted to outcompete weed species. See potential species listed in the Technique Compatibility Tool.

SOIL

Healthy soils and compatible soil conditions are critical to the viability and success of a restoration project. For example, issues such as soil compaction, excess rock fragments (or lack of fine-grained substrate), and lack of organic material can challenge establishment of new vegetation and reduce plant vigor. See the U.S. Forest Service's restoration techniques online document for more information on soil conditions and restoration (U.S. Forest Service n.d.).

Mulching

Mulch helps retain soil moisture, prevent soil erosion and compaction, prevent weed establishment, increase water infiltration, and facilitate seed germination. Mulch can be obtained on-site (from trimming activities), purchased from commercial sources, or may be available from local municipalities or non-profit organizations. Mulch should be certified weed-free or native. Native mulches can also contain native seeds, which may increase native vegetation cover. Mulch should be applied approximately 2 inches thick. Wood bark surface mulch should be avoided in flood prone areas where surface mulch will wash away easily and other soil stabilization methods should be considered (see below).

Soil Amendments

To encourage growth of native plants, soil amendments can be added to change the soil's physical or chemical properties. Amending soils with native soils from a local riparian site can introduce bacteria, fungi, invertebrates, nematodes, and other organisms that are beneficial to native plants. Fertilizers should be used cautiously because excess soil nutrients can stimulate weed growth and drain into the river. Organic matter amendments (available from nurseries or local compost services) can be applied to increase soil moisture retention and facilitate root growth.

Tilling and Decompaction

Soil types and textures may compact differently, such as shallow compaction in sandy soils and deep compaction in clay soils. Densely compacted soils may inhibit plant growth. Tilling or soil decompaction allows water and air to infiltrate the soil and allows plant root establishment. Soils may be tilled or decompacted with hand tools or heavy equipment. Care should be taken when tilling soils because tilling can stimulate weed growth in some cases.

STABILIZATION

Stabilization measures help reduce soil erosion and support the longevity of revegetation efforts. Within the 14,000- and 6,000-cfs conveyance zones, some of these methods may be restricted or require

engineering for implementation. Consultation with the CTWCD and NDWR is needed to ensure compliance with conveyance restrictions and any necessary permitting requirements.

Brush Mattress

Brush mattresses can be installed on streambanks to provide immediate erosion protection, which will eventually become vegetative cover as the native plants grow. The mattress is composed of live plant stakes, live fascines, and branch cuttings.

A diagram of the mattress and an example of methods to construct them can be found online via the Massachusetts Department of Environmental Protection (n.d. [2021]).

Bundled Weeds

Weeds that are manually removed before seed is set may be bundled up with natural fibers to create wattles to be used for erosion control. The wattles will catch water as it flows downslope and can work similarly to erosion control blankets. This method also decreases the need to dispose of large amounts of green waste from project sites.

Erosion Control Fabric

Erosion control fabrics, mats, blankets, and netting can be placed over soils to prevent erosion. The fabrics degrade over time and can be used temporarily until vegetation grows into erosion-prone areas. The fabric can be cut to allow vegetation to grow within its cover. Erosion control products should be plastic-free in restoration areas because plastic netting on wattles and erosion control blankets is a hazard to wildlife and creates plastic pollution in the river.

Fabric Encapsulated Lifts

Soils lifts are composed of soils wrapped with biodegradable fabric or fiber to create a berm-like shape. The lifts are placed where banks have been eroded to add protection. The lifts are seeded, and the soil will shift over time, which eventually creates a vegetated bank to protect against erosion.

Refer to the U.S. Bureau of Reclamation's (BOR's) *Bank Stabilization Design Guidelines* for design information (BOR 2015).

Fascine Installation

Fascines, which are composed of bundles of cut stems and branches, can be added to streambanks to stabilize banks, increase infiltration, and increase other river functions. Live fascines, which will root and grow into plants, or inert fascines, which will not grow, may be used. If the fascine is installed in or near the water, the structures will provide habitat for aquatic species and will improve water quality. This method also decreases the need to dispose of large amounts of green waste from project sites.

See Sotir and Fischenich (2001) for fascine information and design methods.

Hydromulch

Hydromulch, which is a mixture of water, fiber mulch, and tackifier, can be applied to steep (20%–60%) slopes to prevent erosion where rocks and vegetation may not be effective. The slurry is generally applied from a tank on a truck or trailer so only accessible areas may be hydromulched. In areas that could be revegetated, a layer of seed and fertilizer can be applied followed by a layer of mulch and tackifier.

See the online NRCS hydromulching fact sheet for further information (NRCS 2012).

Large Woody Debris

Large woody debris, such as tree trunks and rootwads, can be placed around channels to provide a natural source of bank stability and to provide habitat complexity for aquatic species. The general design of this method includes placing a trunk into the bed or bank with woody debris extending into the channel and securing it by burying or armoring it with boulders to prevent its release. Woody debris is best added to banks that are already stable because as erodible soils could also release the material. Vegetation can be added around the installment.

Refer to the BOR's *Bank Stabilization Design Guidelines* for design information (BOR 2015).

Live Stakes

Plants that root from stem or root cuttings and that will spread along a streambank are candidates for live staking, including willow (*Salix* sp.) and cottonwood species. (Note, cottonwood replacement should be carefully considered within regulated conveyance zones; see Tree Replacement sections above.) Revegetation will provide bank stability and ecosystem services for native species. Choose appropriate sites to plant to ensure success of the live staking. The site should have water during the growing season (May through September), soils with nutrients to support the plants and that will allow roots to extend into the water table, and moderate flows that will support the plants but not damage them.

Refer to the BOR's *Bank Stabilization Design Guidelines* for more information (BOR 2015).

Live Stakes in Riprap

Live stakes can be placed among rocks or boulders to increase slope stabilization, a technique known as planted riprap. Including vegetative cover in riprapped areas creates wildlife habitat and increases ecosystem services, such as providing river shading to control water temperature and increase water quality.

Plant materials used within planted riprap are traditionally cuttings from riparian woody plants that extend to the water table. Willow stems are the material of choice for bioengineering structures due to their pliability and ease of establishing via cuttings. If using poles or whips, the cuttings will need to be long enough to reach the low water table with 1 foot above the ground. Placement of thicket-forming willow species will need to carefully consider the public safety needs, specifically maintenance of sightlines, needs to dissuade camping, and trash removal, to ensure any willow tree plantings are compatible with human dynamics in the Project Area.

Rock Placement

Rounded river rock or more angular fractured rock (commonly used as riprap) can be placed on banks for slope stabilization. Riprap is a permanent layer of large stone, cobbles, or boulders used to armor and protect the soil surface against erosion. Although other materials, such as concrete and gabions, can be used, rounded river rocks and more angular riprap allow for rock and soil movement and mitigate some of the environmental impact of armored banks.

Angular riprap is commonly used as a method to discourage human use. It is important to note that angular fractured rock commonly has sharp edges and can be a safety concern (in some cases), creating a hindrance to recreational access and river rescue operations. Including vegetation or rounded boulders, minimizing fractured rock cover, and using other bank stabilization methods are strategies to maintain riparian function while encouraging human use (where desired). Refer to the BOR's *Bank Stabilization Design Guidelines* for riprap information and design methods (BOR 2015).

Soil Traps

Sediment catchments, such as wattles, silt fences, sediment barriers, and check dams, may be installed in select locations to reduce sedimentation from erosion and to increase water quality. Soil traps may need to be inspected after storm or flood events and have excess sediment removed from the sediment catchments.

The *Nevada Construction Site Best Management Practices Field Guide* (Nevada Division of Environmental Protection 2013) has installation and supplemental information on soil traps.

DIRECTED HUMAN USE

The Truckee River and many of the banks of the river are public land, a resource available to everyone. The public uses the Truckee River and its corridor in many ways. The most common use of the river corridor is for recreation purposes, including walking, running, biking, rafting, and kayaking. Another common use is for some unhoused individuals to camp along the banks of the river, even with laws in place that make camping along the Truckee River illegal. Whether recreation or encampments, large numbers of users of the river can create heavy impacts on the riverbanks, making it challenging to protect and support a thriving natural environment. The following sections identify strategies to direct where and how humans interact with the Truckee River so that desirable vegetation and natural ecosystem processes can be protected.

Community Engagement in Project Planning and Implementation

Involving a diversity of local community members in the project site planning, installation, and care afterward is crucial to build community members as stakeholders and allies for the project site. Local community engagement creates a sense of ownership of the project site as a place of importance. This engagement work should aim to include a diversity of people across social, economic, cultural, and racial boundaries.

Create Controlled or Stable Access

River access areas should be designed to encourage appropriate use of the area, and adequate numbers of access points should be included in the restoration design. Consider widths of accessways, seasonal changes in water quantity, level of use, sensitive natural resources, and other factors when planning accesses. Rock or timber steps may be a good choice along the Truckee River to delineate appropriate access points and protect the bank from erosion. Consultation with the CTWCD and NDWR is needed to ensure step or trail materials comply with conveyance restrictions.

See the *River Access Planning Guide* for more information (O'Keefe and Secter 2019). Americans with Disabilities Act–accessible trail requirements are provided here: https://www.fs.usda.gov/sites/default/files/Accessibility-Guide-Book.pdf.

Fencing and other Hard Exclosures

Fences may be used to exclude people and ungulates (e.g., wild horses) from sensitive areas. Pick the appropriate type of fence to ensure the intended purpose, such as tall fences to exclude deer and woven wire fences to exclude small animals. Fences require maintenance, such as inspections after storms and vegetation maintenance around the fence. Other types of enclosures, such as thick vegetation, may also control access. Consultation with the CTWCD and NDWR is needed to ensure fencing or hard enclosures comply with 14,000- and 6,000-cfs conveyance restrictions.

Manage Access

River access locations should be designed to encourage appropriate use of the area. Consider widths of accessways, seasonal changes in water quantity, level of use, sensitive natural resources, and other factors when planning accesses.

See the *River Access Planning Guide* for more information (O'Keefe and Secter 2019).

Maintain Sightlines

Promoting sightlines is key to encouraging appropriate human activity along the river and reducing the maintenance toll on municipal, public safety, human service outreach teams, and public land agencies. Sightlines can be created through the plant palette at restoration sites or through regular maintenance of existing vegetation. Sightline design should consider site- and location-specific conditions, such as steepness of slope, proximity to water, and general susceptibility to encampment. As a rule of thumb, tree branches should be kept trimmed above 6 feet, and low-growing vegetation should be maintained at a height at or below 2 feet. This rule can be adjusted to allow vegetation growth between 2 and 6 feet

depending on site conditions, such as steep slopes or near the water's edge where encampments are unlikely. Certain species of vegetation may need to be avoided to maintain sightlines, such as thicket-forming willow species like coyote willow.

Signage

Signs can be used to designate access areas, communicate what types of recreation are allowed, delineate sensitive areas to avoid, and share educational information about the area. Signage may be added to fencing to clearly communicate boundaries. Consultation with the location jurisdiction, CTWCD, and NDWR is needed to ensure signage plans comply with conveyance and other restrictions. If possible, signage should coordinate with the signage standards and designs developed by OTR and its partners.

Trails

Trails can be built around the river to delineate appropriate human-use areas and protect sensitive natural resources. Trails along the Truckee River should be constructed to minimize bank erosion, prevent impacts to revegetated areas, and encourage appropriate recreation.

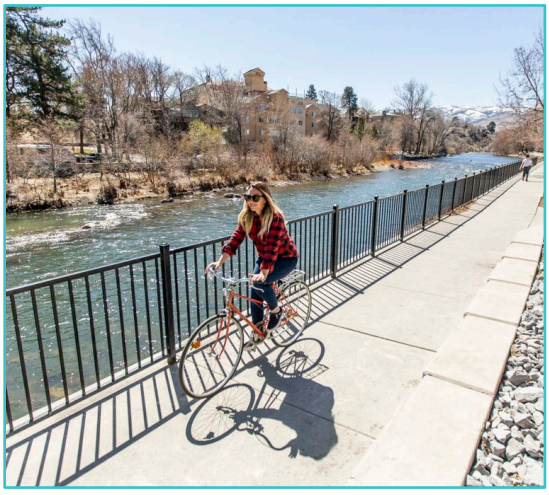
For more information on trail building, please see the online article "Basic Elements of Trail Design and Trail Layout" (American Trails 2007).

For more information about local trail planning and standards, please see the *Truckee Meadows Trail Plan* (Truckee Meadows Trails 2021).

Rock-Covered Surfaces

Large rocks or boulders may be placed strategically to discourage camping and unwanted foot traffic in sensitive areas. Rock placement should carefully consider the need to provide access for positive river use versus the need to dissuade camping or undesired foot traffic. Consultation with the CTWCD and NDWR is needed to ensure rock placement complies with conveyance restrictions.

Public Park Amenities



Inappropriate human use of rivers affects the health of river ecosystems. Providing basic services, such as restrooms, trash bins, and designated use areas, mitigates sources of water pollution and habitat degradation.

See the online article "Community Networking to Preserve Local Rivers" (Srinivas 2016) for more ideas.

Plant Prickly Low-Lying Plants

Prickly plants, such as Woods' rose (*Rosa woodsii*), can be planted in areas to dissuade camping and foot traffic in some situations. Choose species that are compatible with riparian areas.

Managed Access through Vegetation Selection

The vegetation chosen for the plant palette and that is most appropriate for the planting should be carefully considered in planning for directed human use. For example, large, shaded areas with tall or bushy vegetation may create less conspicuous areas that encourage camping, whereas tall trees and low-growing understory vegetation may discourage unwanted camping.

Organize Community Events

Organizing events and activities can give different groups of people a positive reason to visit the project site (e.g., sport games, managed clean-ups, and community garden projects).

Provide Restoration Job Opportunities

Underserved individuals can be hired to implement or maintain restoration areas and clean up trash (to be a model that encourages other people in the community to do the same). They can also support effective communication when engagement with unhoused individuals camping on the project site takes place. The River Stewards program (led by Karma Box) is an example of how underserved individuals are playing an important role in maintaining the health of the river through trash clean-ups and support to connect unhoused individuals with local services.

LITERATURE CITED

American Trails. 2007. *Basic Elements of Trail Design and Trail Layout*. Available at: https://www.americantrails.org/resources/basic-elements-of-trail-design-and-trail-layout. Accessed November 11, 2021.

Bainbridge, David. 2014. *Get Started With More Efficient Irrigation Systems*. Australia: Permaculture Research Institute.

Kelley, K.M., P. Lamont, and J.C. Sellmer. 2007. Pruning Herbaceous Plants. University Park, Pennsylvania: PennState College of Agriculture Sciences. Available at: https://extension.psu.edu/pruning-herbaceous-plants. Accessed November 11, 2021.

Juneau Watershed Partnership. n.d. [2021]. *Techniques for Vegetating Riprap Revetments* Available at: https://www.alaskawatershedcoalition.org/juneauwatersheds/publications/Vol%20III%20Techniques%20for%20Vegetating%20Riprap%20Revetments.pdf. Accessed November 11, 2021.

Lake Bancroft. 2013. Tips for Protecting you Property from Beaver Damage. Available at: https://lakebarcroft.org/community/environmental-quality/beaver-damage-tips#:~:text=Paint%2FSand%20Mix%3A%20%E2%80%9CPainting,of%20sand%20in%20their%20mouth. Accessed November 11, 2021.

Massachusetts Department of Environmental Protection. n.d. [2021]. Brush Mattresses. Available at: https://megamanual.geosyntec.com/npsmanual/brushmattresses.aspx. Accessed November 11, 2021.

Natural Resources Conservation Service (NRCS). 2012. Hydromulching. Available at: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_061752.pdf. Accessed November 11, 2021.

———. n.d. [2021]. *Guidelines for Planning Riparian Restoration in the Southwest*. Available at: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1043256.pdf. Accessed November 11, 2021.

Nevada Department of Agriculture. 2021. Nevada Noxious Weed List. Available at: https://agri.nv.gov/Plant/Noxious_Weeds/Noxious_Weed_List/. Accessed November 11, 2021.

Nevada Division of Environmental Protection. 2013. *Nevada Construction Site Best Management Practices Field Guide*. Available at: https://www.dot.nv.gov/home/showpublisheddocument/3728/636186193540570000. Accessed November 11, 2021.

O'Keefe, T., and J. Secter. 2019. *River Access Planning Guide*. Available at: https://rms.memberclicks.net/assets/RiverAccessGuide/River%20Access%20Planning%20Guide%20%282019%29.pdf. Accessed November 11, 2021.

Resource Concepts, Inc. (RCI). 2017. *City of Reno Public Works Vegetation Management Plan, Phase 1: Current Program Description and Recommendations*. Prepared for City of Reno Public Works.

———. 2019. *City of Reno Public Works Integrated Vegetation Management*. Prepared for City of Reno Public Works.

———. 2020. *Regional Parks and Open Space Integrated Vegetation Management Plan*. Prepared for Washoe County Regional Parks and Open Space.

Robinson, M.L., A O'Callahan, and J Anderson. 2013. *Introduction to Pruning.* Reno, Nevada: University of Nevada, Reno, Extension College of Agriculture, Biotechnology, and Natural Resources. Available at: https://naes.agnt.unr.edu/PMS/Pubs/2013-3274.pdf. Accessed April 26, 2022.

Shih, S., and P. Chen. 2021. Identifying tree characteristics to determine the blocking effects of water conveyance for natural flood management in urban rivers. *Journal of Flood Risk Management* 4(4):1–15. Available at: https://doi.org/10.1111/jfr3.12742/. Accessed November 12, 2021.

Sotir, R.B., and C. Fischenich. 2001. *Live and Inert Fascine Streambank Erosion Control*. Available at: https://www.spa.usace.army.mil/Portals/16/docs/civilworks/regulatory/Stream%20Information%20and%20Management/ERDC%20Live%20and%20Inert%20Fascine%20Streambank%20Erosion%20Control.pdf. Accessed November 11, 2021.

Srinivas, H. 2016. *Community Networking to Preserve Local Rivers*. Available at: https://www.gdrc.org/oceans/river-mgmt.html. Accessed November 11, 2021.

Stewards of Our Streams. 2002. Maintenance of Riparian Buffers. Ames: Iowa State University.

Truckee Meadows Trails. 2021. *Truckee Meadows Trail Plan and Report.* Available at: http://www.tmtrails.com/TrailsReportFINAL2021.pdf. Accessed April 2022.

Tu, M., C. Hurd, and J.M. Randall. 2001. Chapter 1 – Manual & Mechanical Control Techniques. In *Weed Control Methods Handbook: Tools & Techniques for Use in Natural Areas*. Available at: https://www.invasive.org/gist/products/handbook/03.ManualMechanical.pdf. Accessed November 11, 2021.

University of Nevada, Reno. 2022. What is IMP? Available at: https://extension.unr.edu/program.aspx?ID=15. Accessed September 28, 2022.

U.S. Army Corps of Engineers (USACE). 1973. *1973 Martis Creek Lake Operation and Maintenance Manual for the Truckee River.* Sacramento, California: Department of the Army, Sacramento District.

U.S. Bureau of Reclamation (BOR). 2015. *Bank Stabilization Design Guidelines*. Denver, Colorado.

U.S. Environmental Protection Agency (EPA). 2021. Herbicides. Available at: https://www.epa.gov/caddis-vol2/caddis-volume-2-sources-stressors-responses-herbicides. Accessed November 11, 2021.

U.S. Forest Service. n.d. *Chapter 5. Restoration Techniques*. Available at: https://www.fs.fed.us/t-d/pubs/pdf/riparian_restoration/hi_res/RipRestChap5.pdf. Accessed November 11, 2021.

This page intentionally left blank.